

INSTRUCTION BOOK

**P300
LINE PRINTER**

PART OF

FLIGHT SERVICE AUTOMATION SYSTEM

VOLUME II

**CONTROLLED
DOCUMENT**

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CONTRACTOR

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This equipment generates, uses, and can radiate radio-frequency energy and, if not installed and used in accordance with the operator's and the user's manuals may cause interference with radio communications. It has been tested and found to comply with the limits for a Class "A" computer device, pursuant to subparagraph "J" of part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user - at his own expense - will be required to take whatever measures may be required to correct the interference.

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P-SERIES GENERAL DESCRIPTION

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1.0 P-SERIES GENERAL DESCRIPTION

1.2 DOT CHARACTER FORMATION

P-Series printers create characters by assembling groups of dots in matrices. Dots are overlapped to produce a solid appearing character of uniform density. Dot impression is made by an assembly of hammers installed on a moving shuttle which impacts the paper through the ink ribbon. Horizontal shuttle movement and vertical paper advance position the dots to form the character matrix.

1.3 DOT MATRIX LINE PRINTING

Unlike single head dot matrix printing, the P-Series generate graphics and characters by printing entire dot rows. As shown in Figure 1-1, dots are printed in both directions of shuttle travel. Paper is advanced as the shuttle reverses direction and the next row of dots are printed.

During each scan of the shuttle, hammers are activated to print dots at selected positions in a single dot row. When the shuttle comes to the end of a scan, it reverses direction. Paper is advanced one row, and the required hammers are activated to print the next row of dots.

After an entire line of characters is printed, hammer activity ceases and the paper is advanced to the first dot row of the next print line. This creates a series of blank rows between lines of characters. The number of rows allowed for a line separation depends on the line spacing selected. Line spacing may be selected by the operator or the host computer.

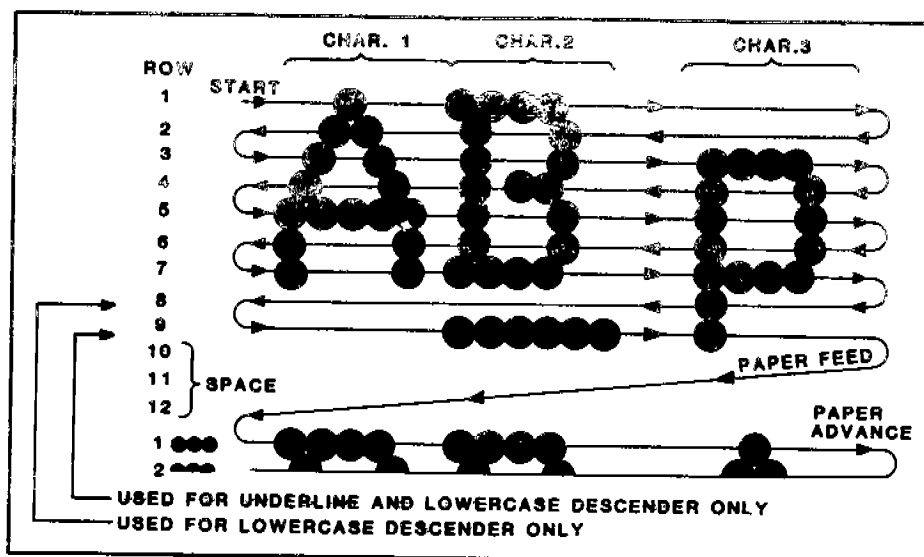


FIGURE 1-1.
PRINTRONIX CHARACTER FORMATION

OPERATION

2

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2.0 OPERATION

2.1 OPERATOR PANEL CONTROLS AND INDICATORS

Section two includes an overview of the operation and cleaning procedures for P-Series printers. Refer to the P-Series Operator's Guide for detailed information regarding:

- ◊ Paper loading/unloading
- ◊ Ribbon installation/replacement
- ◊ Cleaning/maintenance

P-Series printers function either online or offline. When online the printer is capable of receiving data and control commands from the host computer. If offline there is no communication between the printer and the host computer.

The offline condition is used to perform the following tasks:

- ◊ Load Paper and Ribbon
- ◊ Set Top-of-Form
- ◊ Advance Form
- ◊ Set Line Spacing
- ◊ Adjust Paper Tractors and other Internal Features
- ◊ Cleaning

There are two basic operating modes for P-Series printers: Print Mode and Plot Mode.

- ◊ The Print mode generates characters and text using of a standard character set in the printer's memory.
- ◊ The Plot mode is used to generate dot addressable graphics by means of data received from the host computer.

2.0 OPERATION

2.1 OPERATOR PANEL CONTROLS AND INDICATORS (Continued)

P-Series controls and indicators are located on the operator panel (Figure 2-1). The ac power switch is located on the left base of the printer. Table 2.1 lists and describes the function of each switch and indicator.

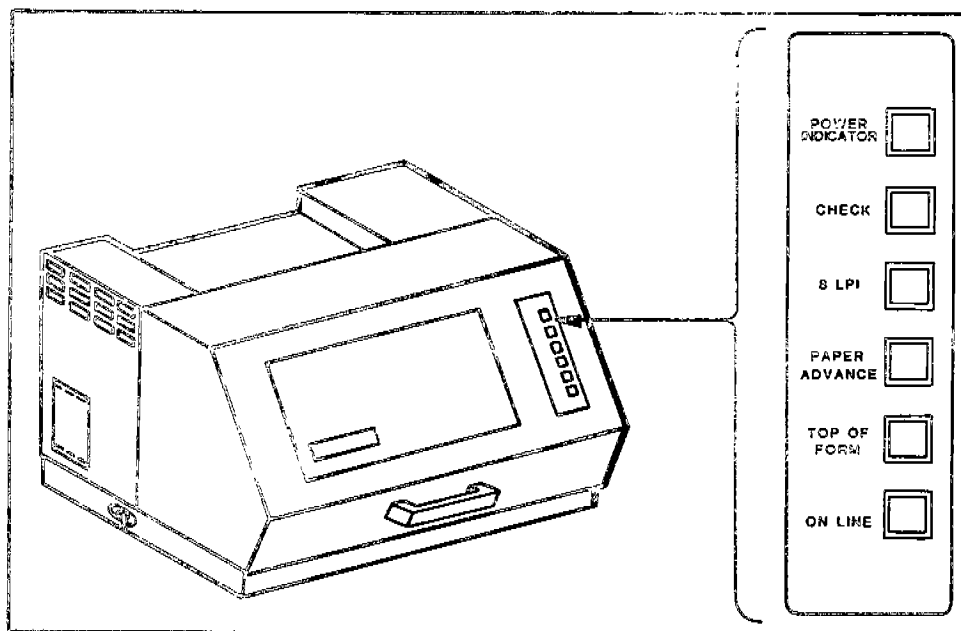


FIGURE 2-1.
OPERATOR PANEL AND POWER SWITCH

2.0 OPERATION

2.1 OPERATOR PANEL CONTROLS AND INDICATORS (Continued)

- FRONT PANEL SWITCHES AND INDICATORS - Switches and indicators located on the front panel are described in Table 2-1 and illustrated in Figure 2-1.

TABLE 2-1.
FRONT PANEL SWITCHES AND INDICATORS

SWITCH/INDICATOR	FUNCTION
POWER/INDICATOR	Illuminates when the power switch is ON.
CHECK	<p>Illuminated when:</p> <ul style="list-style-type: none"> ◊ Platen is in the open position. ◊ No paper is in the printer. ◊ No paper motion during printing. ◊ Power supply is interrupted or not sufficient. <p>Press the CHECK switch to extinguish the indicator after a paper fault is cleared. The indicator is automatically extinguished when any other fault is cleared.</p>
8 LPI	Illuminated when an 8 lpi or alternate lines per inch spacing is selected. Indicator is extinguished when the default 6 lpi spacing is selected. The default switch setting (extinguished) may be overridden by host computer control. Alternate lpi settings may be changed by hardware configuration.
PAPER ADVANCE	Advances (slews) the paper as long as it is held down.
TOP OF FORM	Advances the paper to the top of the next form or to Channel 1 if the EVFU is loaded. The switch is operable only when the printer is offline. The indicator is illuminated when the EVFU is loaded or the Forms Length Selector option is installed.
ON LINE	Illuminates when the printer is online. Press to select offline. Printer automatically selects offline when a fault occurs.

2.0 OPERATION

2.2 PAPER ADJUSTMENT CONTROLS

The controls listed below adjust the printer for:

- ◊ Paper size
- ◊ Paper thickness
- ◊ Paper position

Figures 2-2 through 2-4 show the location of each control.

CONTROL	FUNCTION
FORM THICKNESS ADJUSTMENT LEVER	Raises and lowers the platen to adjust or various paper for forms thickness. Raise fully to load paper.
FORM THICKNESS SCALE	Aligns with Form Thickness Adjustment pointer to indicate relative thickness of forms or paper.
PAPER TRACTORS	Sets left margin and paper width by sliding left and right.

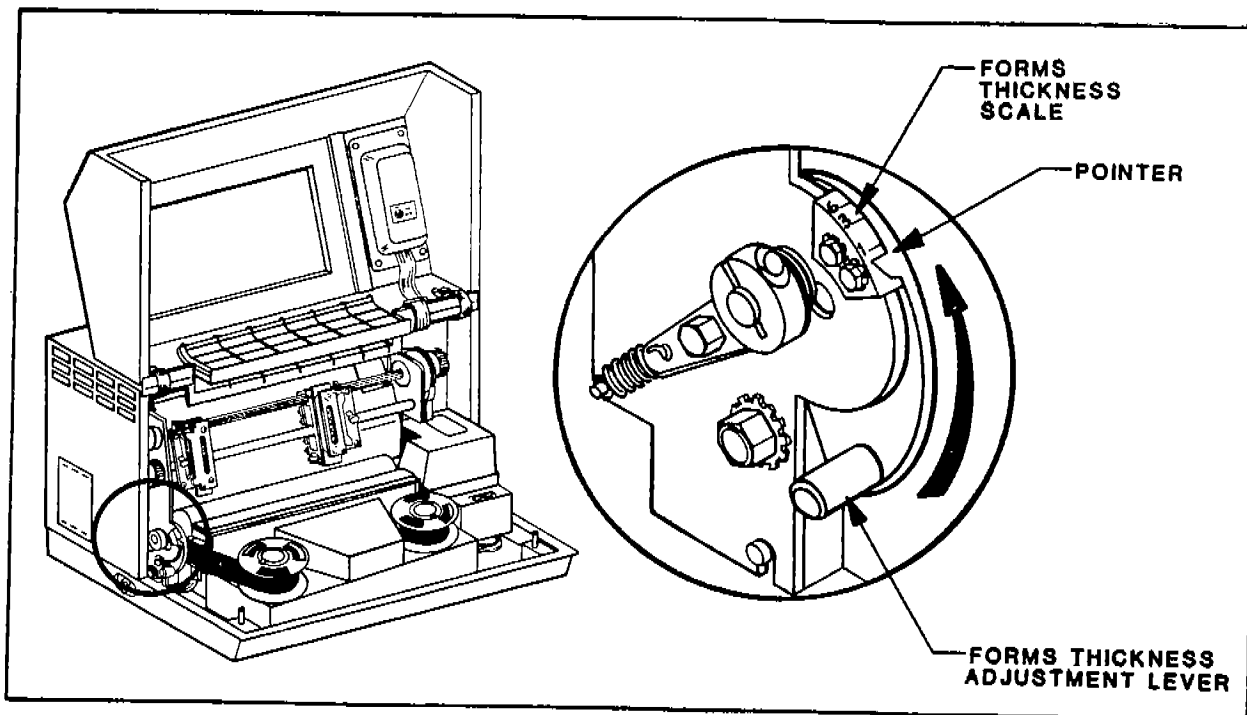


FIGURE 2-2.
PAPER ADJUSTMENT CONTROLS AND INDICATORS

2.0 OPERATION

2.2 PAPER ADJUSTMENT CONTROLS (Continued)

CONTROL	FUNCTION
TRACTOR POSITION LOCKS	Locks the left and right paper tractors into position by tightening clockwise.
HORIZONTAL POSITION KNOB	Allows fine positioning of left print margin. Rotate to move paper left or right.

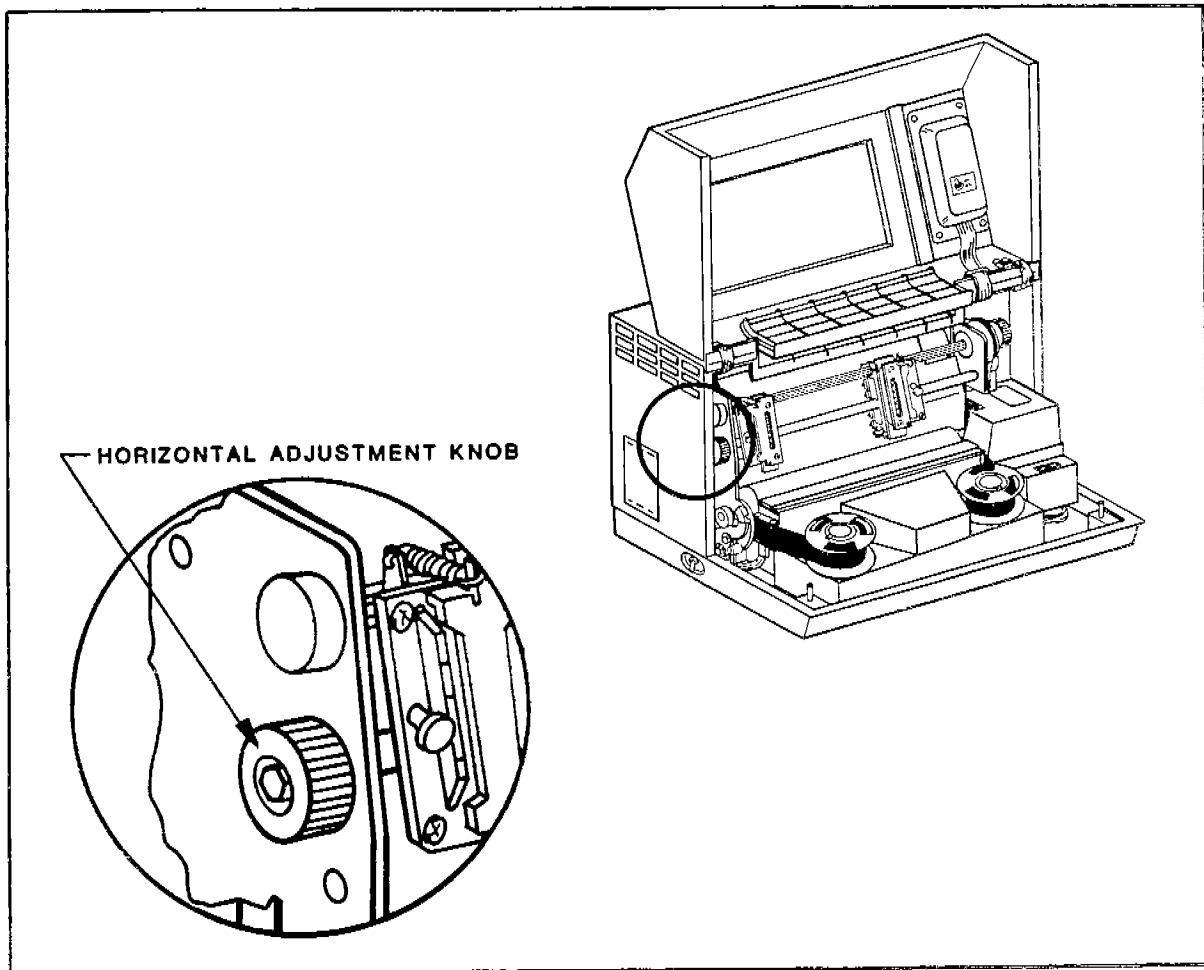


FIGURE 2-3.
HORIZONTAL POSITION KNOB

2.0 OPERATION

2.2 PAPER ADJUSTMENT CONTROLS (Continued)

CONTROL	FUNCTION
VERTICAL POSITIONER KNOB	Sets the Top-of-Form or the first line to be printed. Rotate to move paper vertically up or down.
VERTICAL POSITION DISK	Provides a reference mark for setting the Top-of-Form or first line to be printed.
FORMS LENGTH SELECTOR OPTION	Adjusts for alternate length forms or paper.

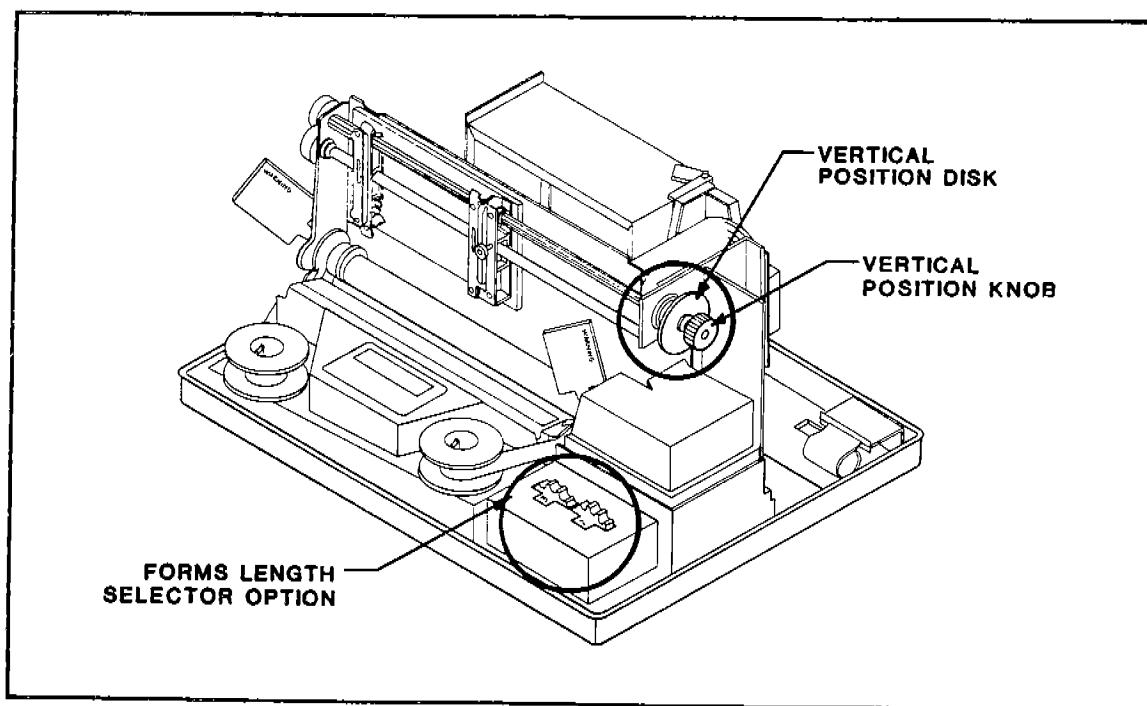


FIGURE 2-4.
VERTICAL POSITION KNOB, DISK AND FLS

2.0 OPERATION

2.3 LOADING/UNLOADING PAPER

P-Series printers use standard fanfold tractor feed paper from 3 to 16 inches wide. Multi-part forms of up to six thicknesses may be used for printing duplicate copies. To load paper follow instructions in the P-Series Operator's Guide.

Remember to reset the Forms Thickness Lever to the appropriate paper thickness after loading paper.

2.4 TOP-OF-FORM ADJUSTMENT

Correctly setting the Top-of-Form allows the operator or host computer to rapidly advance paper to the next form or sheet of paper.

Top-of-Form may be defined in two different ways:

- ◊ Physical Top-of-Form
- ◊ First Line to be Printed

● PHYSICAL TOP-OF-FORM

The physical Top-of-Form is the very first line of the paper or form. When physical TOF setting is used the printer will advance paper approximately 66 lines (11 inch vertical paper at 6 lines per inch) to the first line of the next form. From this TOF position several line feeds may be needed to advance paper further to the first line to be printed.

● FIRST LINE TO BE PRINTED

This Top-of-Form setting is best used when running an EVFU control program. The first line to be printed is simply the first line of a form that requires printing. Using this TOF setting eliminates the necessity of additional line feeds to locate the first line to be printed. Host computer and EVFU control of Top-of-Form is discussed further in Programming, Section 4.0 of this manual.

2.0 OPERATION

2.4.1 SETTING THE TOP-OF-FORM

Set either Top-of-Form as follows:

1. Turn the POWER switch ON.
2. Make sure the printer is OFF LINE.
3. Raise the Forms Thickness Adjustment lever to the open position.
4. Turn the Vertical Positioner Knob to place the first line to be printed or the first line of the form (physical TOF) opposite the Top-of-Form mark, as shown in Figure 2-5.
5. Hold the Vertical Adjustment Knob to prevent paper from moving. Rotate the Vertical Position Disk to align the white reference mark on the disk with the fixed pointer.
6. Rotate the Vertical Positioner Knob one revolution backward, lowering the paper until the reference mark is again aligned with the pointer, see Figure 2-6. This positions the TOF at the print station.
7. Close the Forms Thickness Lever. The paper is now positioned to start printing.
8. Press the TOP OF FORM Switch.

NOTE: Each time the Top-of-Form switch is pressed, paper will advance to the top of the next form (assuming the printer is offline).

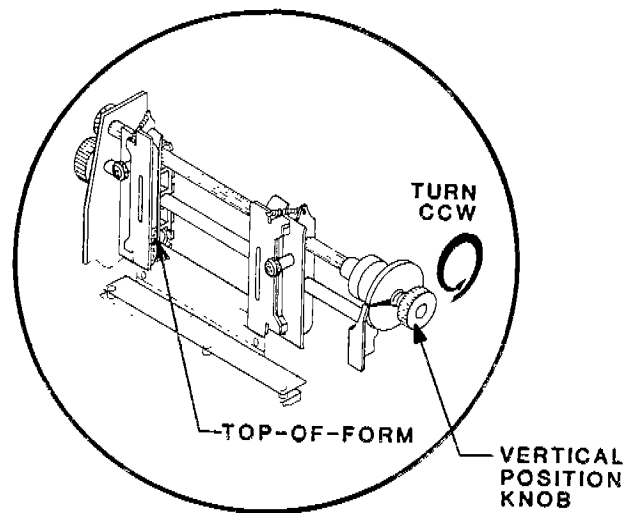


FIGURE 2-5
VERTICAL POSITIONER KNOB

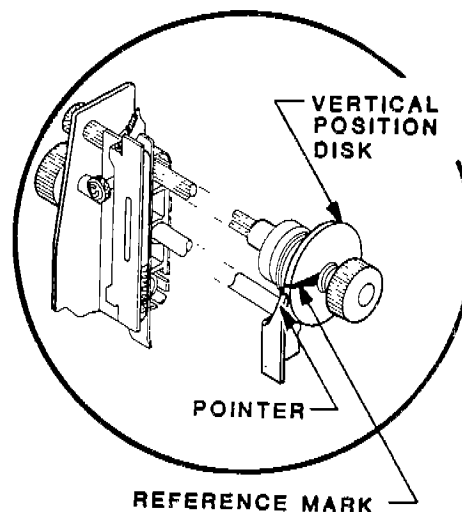


FIGURE 2-6.
VERTICAL POSITION DISK

2.0 OPERATION

2.5 OPTIONAL CONTROLS AND INDICATORS

The controls and indicators that follow operate these P-Series options:

- ◊ Forms Length Selector
- ◊ Compressed Print
- ◊ Multi-Mode Print

2.5.1 FORMS LENGTH SELECTOR OPTION

The Forms Length Selector option (Figure 2-7) allows the operator to set the length of paper or forms to a maximum of 16½ inches. This is useful when printing non-standard length (11 inch) forms. To set the FLS simply enter the number of lines per form on the two thumbwheel switches. To determine the number of lines per form multiply the total form length in inches by six.

For example.....

an 8½ inch form
has 51 lines
(8.5 x 6 = 51).
Enter the number 51
on the thumbwheel
switches. When a Form
feed or Top-of-Form
command is issued,
the paper will advance
51 lines. Setting the
FLS to 00 disables its
operation.

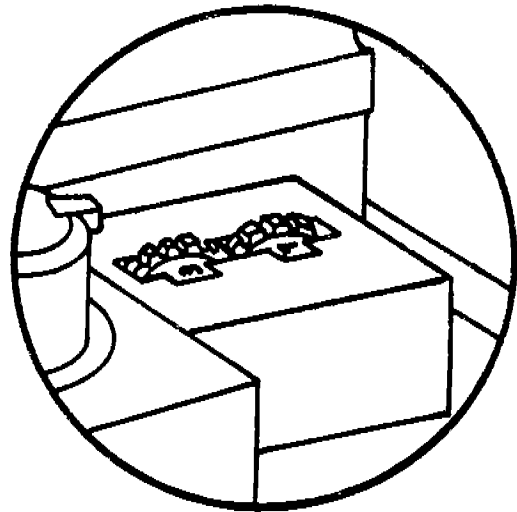


FIGURE 2-7.
FORMS LENGTH SELECTOR

Installation of the Forms Length Selector (FLS) modifies the operation of the standard Electronic Vertical Format Unit (EVFU) depending on the revision level of the Logic B PCBA contained in the printer.

For additional installation and operation information see the Forms Length Selector Option Instruction Manual.

2.0 OPERATION

2.5.2 COMPRESSED PRINT OPTION

The Compressed Print option allows the operator to choose either Normal (data processing) print or Compressed print.

The Compressed Print option is selected by a two position toggle switch located on the inside of the printer cover. Figure 2-8.

The switch setting determines the default print style.

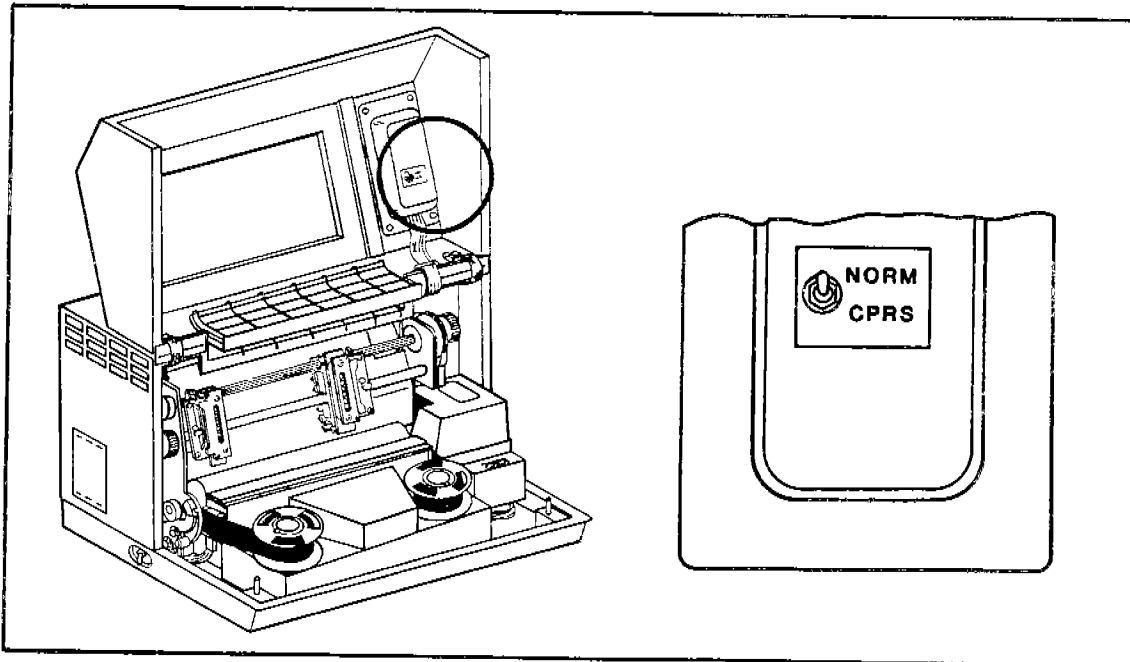


FIGURE 2-8.
COMPRESSED PRINT SWITCH

When set in the NORM position, the printer automatically selects Normal print unless a host computer control code requests Compressed print. A Compressed print request will always override the switch setting.

If a Compressed print code is received, the printer generates a single Compressed character line and then reselects Normal print. The Compressed print control code must accompany each character line or the printer defaults to NORMAL.

The CPRS switch position selects only Compressed print. Host computer requests for any other print style are not honored.

2.0 OPERATION

2.5.3 MULTI-MODE PRINT OPTION

The MULTI-MODE print switch allows the operator to choose either Normal (data processing), Compressed, or Draft print.

The MULTI-MODE print switch, Figure 2-9, is a three position toggle switch located on the inside of the printer cover. The switch setting determines the default print style.

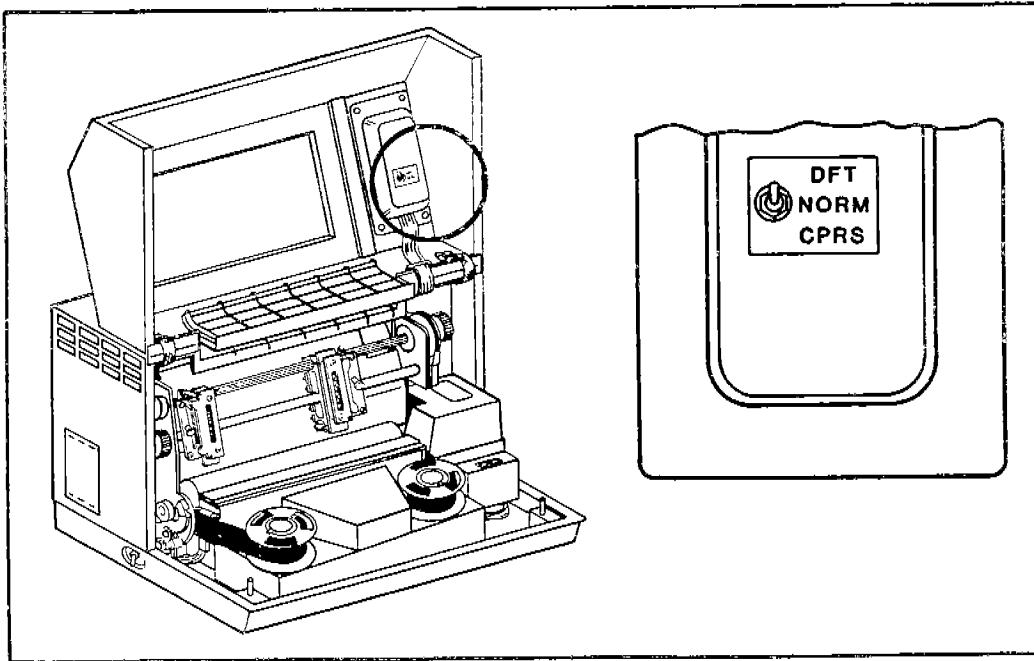


FIGURE 2-9.
MULTI-MODE PRINT SWITCH

When set in the NORM position, the printer selects Normal print unless a host computer control code requests either Draft or Compressed print. Host computer requests will override the NORM switch setting.

When the switch is set in the DRFT position, low density Draft print is the default type print unless a host computer control code requests Compressed print. A Compressed print request will always override the switch setting.

When the switch is set in the CPRS position, only Compressed style print is available. Host computer requests for any other print style are not honored.

2.0 OPERATION

2.6 HOST COMPUTER CONTROL CODES

Both standard and optional print functions can be controlled by the host computer. Control characters input at the host keyboard will readily access printer functions. The standard ASCII control characters used by the P-Series to access printer functions are listed in Table 2-3. Control characters and their equivalent programming codes are discussed in greater detail in Programming, Section 4.0.

A control character is generated by holding down the CNTRL key (indicated by the symbol ^) and then pressing the appropriate alphanumeric key.

For example.....

CNTRL + M = Carriage Return.

TABLE 2-2.
ASCII CONTROL CHARACTERS

PRINTER FUNCTION	ASCII KEY
8 LPI SPACING.....	^F
ALTERNATE CHARACTER SELECT..... (shift in)	^O
ALTERNATE CHARACTER SELECT..... (shift out)	^N *
CARRIAGE RETURN.....	^M
COMPRESSED CHARACTERS (optional).....	^A
DELETE.....	delete
DOT PLOT, EVEN.....	^D
DOT PLOT, ODD.....	^E
DRAFT CHARACTERS (optional).....	^B
ELONGATED CHARACTERS.....	^H *
EVFU, START.....	**
EVFU, END.....	**
FORM FEED.....	^L
LINE FEED.....	^J
SPACE.....	Space Bar
VERTICAL TAB.....	^K

* Alternate control code can be assigned.

** Dependant upon user software.

2.0 OPERATION

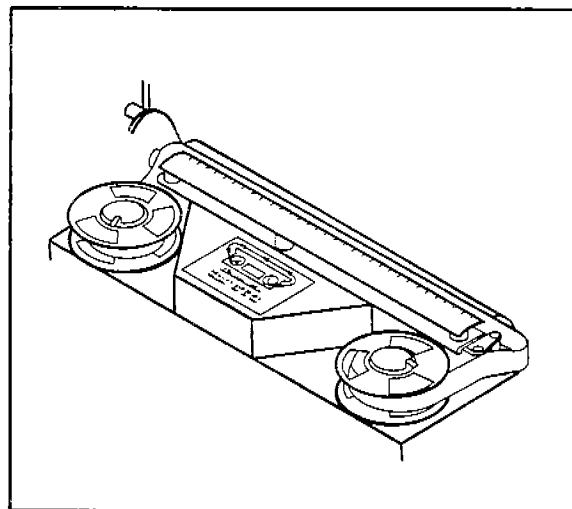
2.7 CHANGING RIBBON

Ribbon life will average 150,000 printed lines under normal operating conditions.

To change P-Series ribbons:

1. Open the Forms Thickness Adjustment lever.
2. Unlock both ribbon spools by pulling latches toward the center of the hubs. Lift spools from hubs. (Figure 2-7) clearing loose ribbon from the guides and ribbon slot. Discard used ribbon and spools.
3. Check for any ribbon chaff build up around the guides and clean if necessary with soft cloth.
4. Install new ribbon spools on the hubs with ribbon threaded as shown on the ribbon deck decal.

For further information on ribbon replacement, refer to the P-Series Operator's Guide.



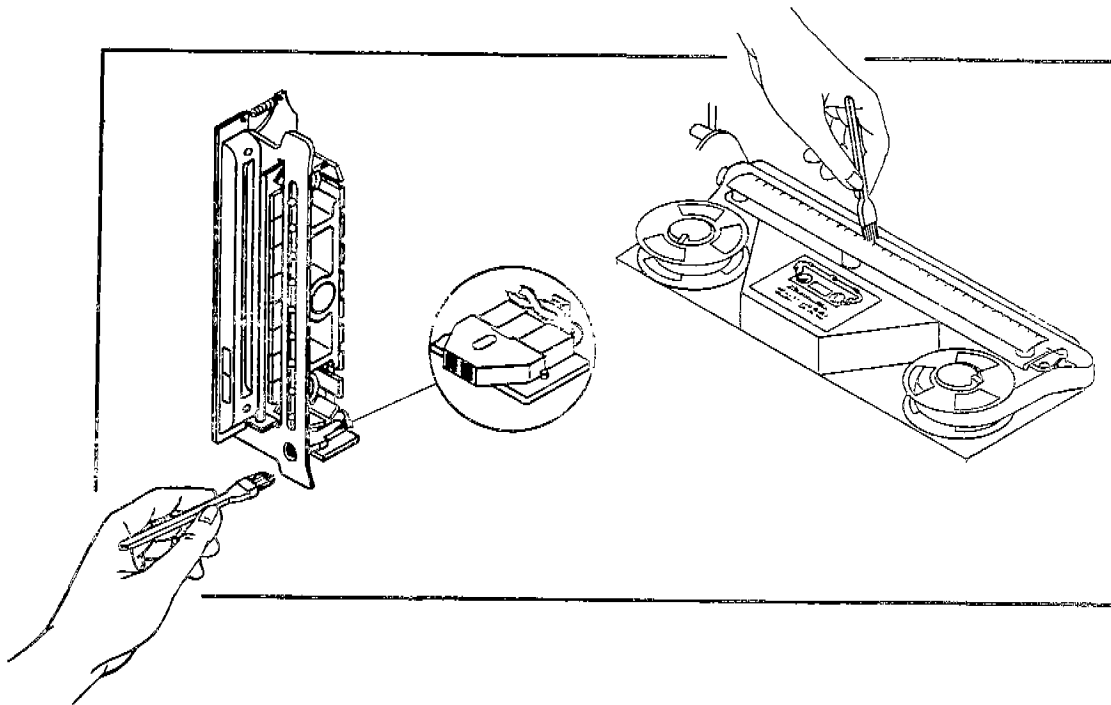
**FIGURE 2-10.
P-SERIES RIBBON DECK**

2.0 OPERATION**2.8 CLEANING**

The printer should be cleaned at intervals of approximately 250 hours or three months of operation. Dusty site conditions and accumulation of ribbon ink and paper chaff heavy duty use will necessitate a shorter interval for cleaning.

Use the following cleaning procedures:

1. The exterior cabinet is cleaned with a soft cloth and mild detergent. Do not use an abrasive powder or cleaning agent as this will damage the surface.
2. Use a soft bristled brush to clean the ribbon guide areas and the paper motion sensor of any debris or ribbon chaff.



**FIGURE 2-11.
CLEANING RIBBON GUIDE**

2.0 OPERATION

2.8 CLEANING

3. Use a vacuum to clear dust and chaff from the base and paper path areas. Figure 2-12.

If print quality deteriorates or there is evidence of extreme chaff accumulation, call the Printronix service representative.

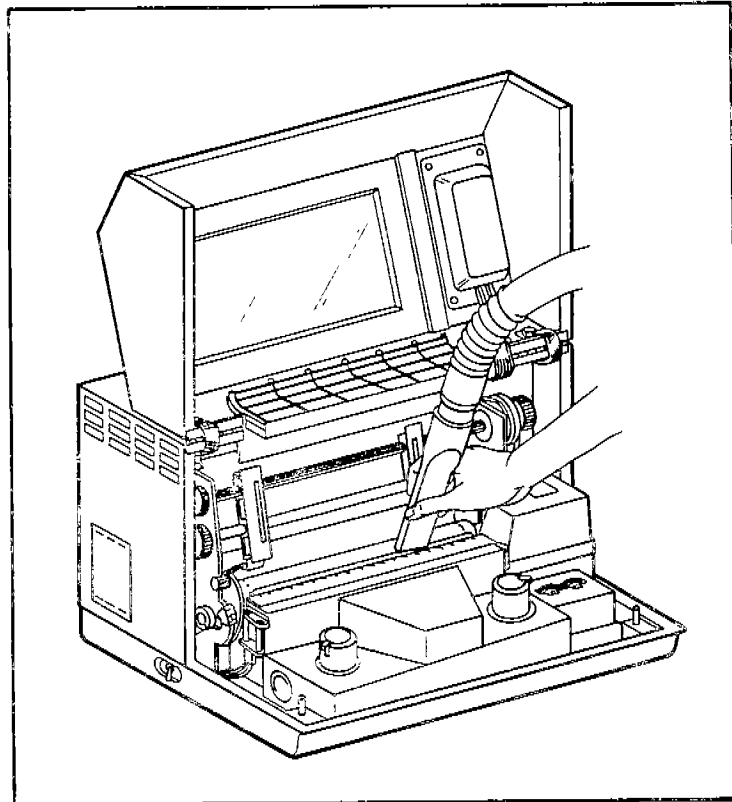


FIGURE 2-12.
VACUUM CLEANING

For further cleaning procedures, refer to the P-Series Operator's Guide.

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3.0 CONFIGURATION

Section three provides information and procedures to configure (modify) the P-Series printer. The P-Series printers are designed to execute a variety of printer functions. These functions are divided into two categories; host controlled functions and hardware selectable functions. Table 3-1 lists host controlled functions. Table 3-2 lists hardware selectable functions.

Identifying Logic PCBAs and their available functions is detailed in Section 3.1 and Tables 3-3 through 3-7. Section 3.1.1 illustrates PCBA removal and replacement.

Section 3.2 describes hardware-selectable function jumpers and their location on Logic PCBAs. Tables 3-8 through 3-28 define each function and jumper condition. Jumper locations for each logic PCBA are illustrated in Figures 3-4 through 3-6. A complete summary of all hardware selectable functions and associated jumpers is provided in Table 3-29.

Optional and custom character PROMs are discussed in Section 3.3.

3.0 CONFIGURATION

The most basic and commonly used functions are accessed and controlled by the host computer with control characters. Table 3-1 lists and describes these basic functions.

TABLE 3-1.
HOST CONTROLLED FUNCTIONS

FUNCTION	DESCRIPTION
8 LPI Spacing	Increases the total number of lines per page.
Alternate Character Select	Allows rapid access to alternate character sets.
Carriage Return	Returns the print station to the left margin.
Compressed Characters (Optional)	Allows compressed type print 198/220 characters per line.
Delete	Deletes characters.
Draft Characters (Optional)	Allows high speed printing of low density characters, 132 character/line.
Elongated Characters	Creates double height characters.
Even Dot Plot	Creates high resolution graphics when combined with odd dot plot.
EVFU End	Completes the load operation EVFU.
EVFU Start	Starts the EVFU load operation.
Form Feed	Moves paper to next Top-Of-Form.
Line Feed	Causes the printer to advance the paper vertically one line.
Odd Dot Plot	Creates normal resolution graphics.
Space	Creates an empty character column.
Underline	Underlines characters.
Vertical Tab	Enables the EVFU to advance paper to a predetermined line

3.0 CONFIGURATION

In most cases P-Series printers have been configured by Printronix at the request of the user. If, however, user needs should change or expand, the hardware can be reconfigured to provide different functions.

In addition to the basic host controlled functions, the P-Series printers include hardware-selectable functions. By selecting various combinations of these functions the user can configure (modify) the printer to meet specific needs and applications.

A brief description of each hardware-selectable function is listed below in Table 3-2.

3.0 CONFIGURATION

TABLE 3-2.
HARDWARE SELECTABLE FUNCTIONS

FUNCTION	DESCRIPTION
8 lpi = 8 lpi	For PCBA B4 only.
8 lpi = 9 lpi	Changes value of 8 lpi switch.
8 lpi = 10 lpi	Changes value of 8 lpi switch.
8 lpi Only	For printing 8 lpi only.
8 LPI/9 LPI/10 LPI	Changes LPI function switch.
2716 Enable	Enables use of A6 character PROMs.
Alternate Character Select Shift-in or Shift-out	Changes access to alternate character set.
Alternate Compressed Print	For P300 only, 176 char./line.
Alternate Forms Length Select	Allows 12 inch paper default.
Automatic Line Feed	a. Line feed sent from host computer. b. Automatic line feed when print buffer full.
Carriage Return = New Line	a. Automatic line feed when CR received. b. Host must send line feed.
Compressed Print	Allows compressed type print option, 198/220 char./line.
Control Code Select	Allows alternate programming codes to control print functions.
Count 12 Lines Before Fault Stop	Printer advances 12 lines after paper out.
Data Bit 8 Disable	Determined by interface.
Dot Plot Mode	Single and double density graphics.
Double Speed Plot	For high speed graphics.
Draft Mode Select	Allows draft style print option 132 CPL (characters per line).

3.0 CONFIGURATION

TABLE 3-2.
HARDWARE SELECTABLE FUNCTIONS (Continued)

FUNCTION	DESCRIPTION
Electronic Vertical Format Unit Disabled.	EVFU control codes will be ignored.
Enables 8th Dot Row	Character height adjustment.
ESR = 132	Limits line length to 132 char. (Used with ESR = LF).
Even Dot Plot Enable	Required for High Resolution graphics.
High Vertical Resolution PROM	Allows special character sets.
I/O Polarity	High or low true interface.
Inverted Data Strobe	For alternate interface.
Modified Plot	Eliminates need for extra line feed when exiting Plot Mode.
Move 1 Line Binary Count	Matches printer to host binary count system.
NPAL Jumper	9 dot row printing.
P300 Enable	Configures PCBAs for Model P300.
P600 Enable	Configures PCBAs for Model P600.
Paper Instruction Disable	Determined by interface.
Paper Motion Detect Disable	Disables paper motion detector when using colored paper that interferes with printer operation.
Phase Fire Enable	For P600 only.
Print Lowercase as Uppercase	Prints uppercase characters when lowercase codes are received.
Skip over Perforation	Specifies number of blank lines above paper perforation.
Stop on Fault	Printer stops on paper fault.
Underline Disable	Disables underline function.

3.0 CONFIGURATION

Some printer functions are not available to each printer. The model and particular circuit boards installed determine which functions are available.

To determine what functions can be configured on your printer, it is necessary to identify the installed printed circuit board assemblies (PCBA).

NOTE: By installing new revision circuit boards, all listed functions and options should be available. For information on circuit board replacement, call the Printronix Customer Service Department.

3.1 LOGIC PRINTED CIRCUIT BOARDS

Each P-Series printer contains an A and a B Logic Board (PCBA). There are five different versions of each A and B PCBA. It is important to know what version A and B board is installed in a printer before reconfiguring.

Logic PCBAs are mounted in a Card Cage located inside the printer. Figure 3-1 illustrates the Card Cage Location.

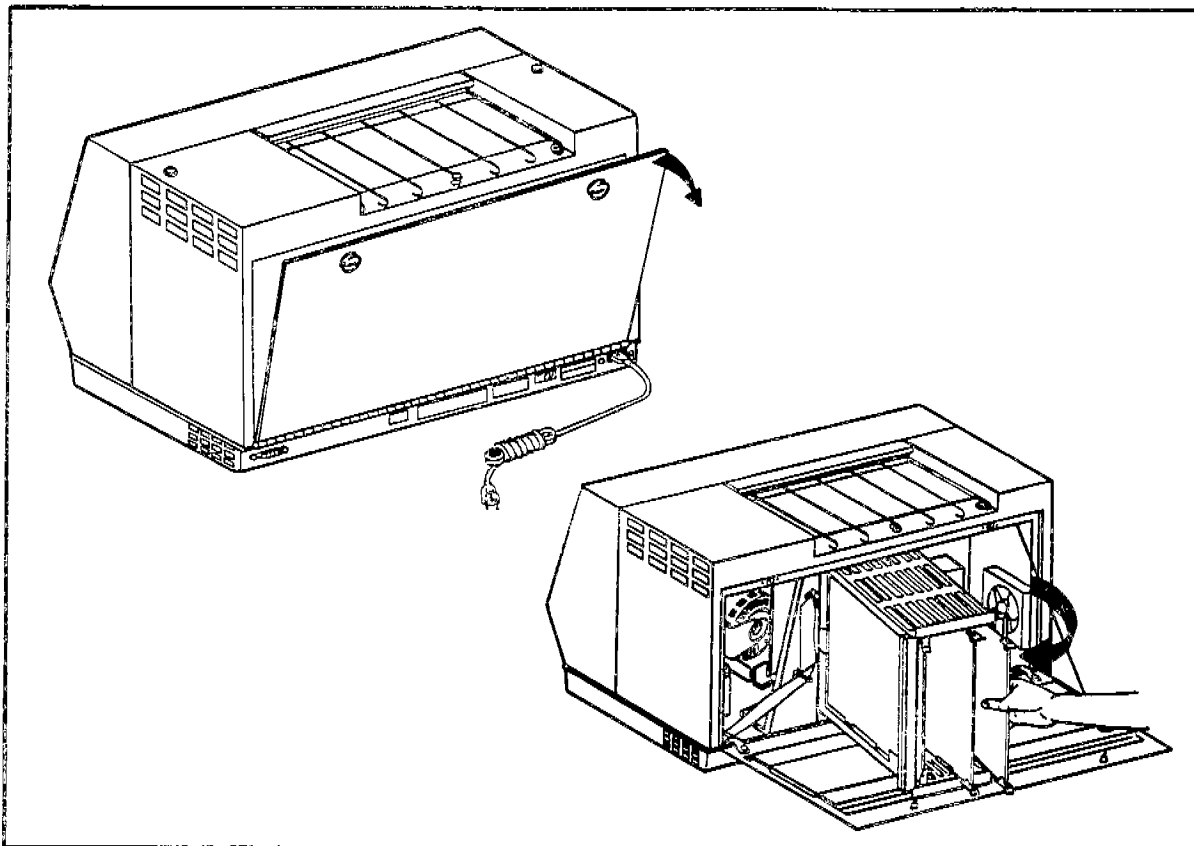


FIGURE 3-1.
CARD CAGE LOCATION

3.0 CONFIGURATION

3.1 LOGIC PRINTED CIRCUIT BOARDS

To gain access to the Card Cage:

1. Disconnect the AC power cord.
2. Loosen the two $\frac{1}{4}$ turn fasteners located at the back of the printer panel and open the rear panel.
3. The Card Cage is hinged on the left and held in place by a magnetic catch. Gently pull the right side of the cage and swing to the left.

Each A and B PCBA is identified in writing on the lower right edge of the board as shown in Figure 3-2. Correct identification is on the solder side of the board just above the white plastic ejection lever. Each board is labeled Logic A1, A2, A4, A6, A7; or Logic B4, B5, B7, B9, B10.

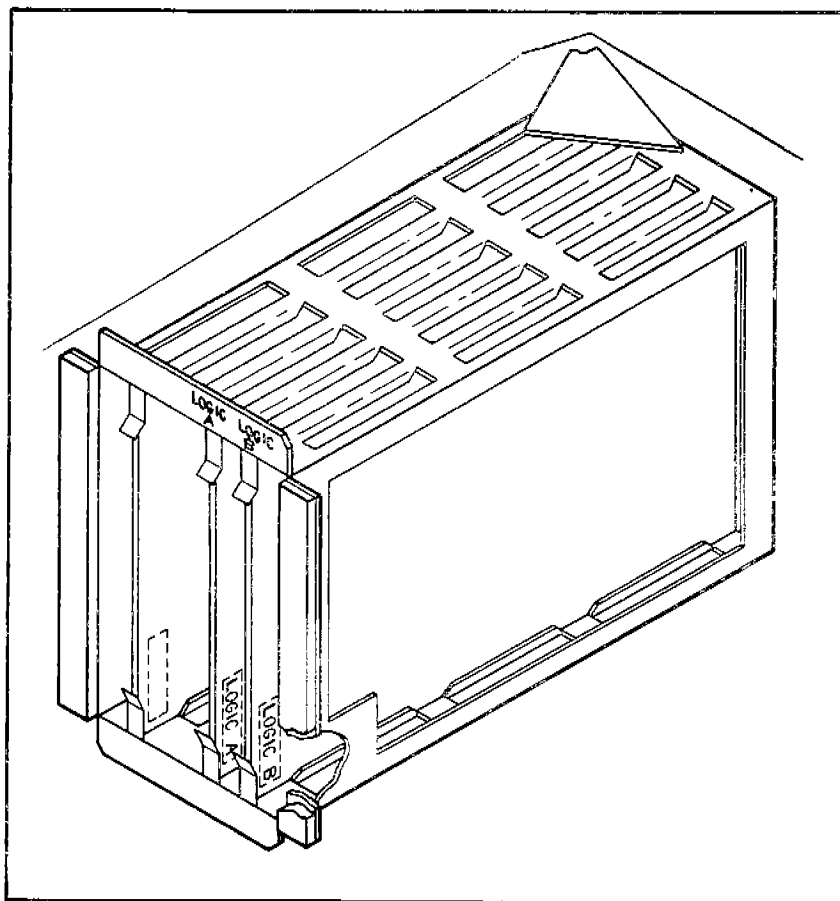


FIGURE 3-2.
LOGIC BOARD IDENTIFICATION

3.0 CONFIGURATION

3.1 LOGIC PRINTED CIRCUIT BOARDS (Continued)

After the PCBA versions have been identified, refer to the following tables to determine the printer functions available to your PCBA versions. Tables 3-3 through 3-7 list the most common A and B PCBA combinations and their respective functions.

NOTE: If your printer is equipped with some other combination of PCBAs, see TABLE 3-29 to determine the available functions.

3.0 CONFIGURATION

3.1 LOGIC PRINTED CIRCUIT BOARDS (Continued)

TABLE 3-3.
LOGIC PCBA A1, B4LOGIC PCBA A1, B4

- 8 lpi = 8 lpi
- 8 lpi = 10 lpi
- 8 lpi (10 lpi) only
- ✓ Automatic Line Feed✓
- ✓ CR=LF✓
- ✓ Data Bit 8 Disable
- ✓ Double Speed Plot
- ✓ Electronic Vertical Format Unit Disable
- ✓ I/O Polarity
- NPAL Jumper Installed for 8 lpi/9 lpi,
omitted for 10 lpi (IN ETCH)
- ✓ Paper Motion Detect Enable
- ✓ PI Disable
- ✓ Print Lowercase as Uppercase
- ✓ Skip over Perforation
- ✓ Underline Disable

3.0 CONFIGURATION

3.1 LOGIC PRINTED CIRCUIT BOARDS (Continued)

**TABLE 3-4.
LOGIC PCBA A2, B5**

LOGIC PCBA A2, B5

8 lpi only

8 lpi = 10 lpi

Automatic Line Feed

Count 12 lines before Fault Stop

CR=LF

Data Bit 8 Disable

Double Speed Plot

Electronic Vertical Format Unit Die

I/O Polarity

Move One Line Binary Count

Paper Motion Detect Enable

PI Disable

Print Lowercase as Uppercase

Skip over Perforation

Stop on Fault

Underline Disable

3.0 CONFIGURATION

3.1 LOGIC PRINTED CIRCUIT BOARDS (Continued)

TABLE 3-5.
LOGIC PCBA A4, B7

LOGIC PCBA A4, B7

8 lpi only
 8 lpi = 10 lpi
 Automatic Line Feed
 CR=LF
 Data Bit 8 Disable
 Double Speed Plot
 Electronic Vertical Format Unit Disable
 Enables Ninth Dot Row *
 Even Dot Plot Enable
 Inverted Data Strobe
 I/O Polarity
 Modified Plot
 Move One Line Binary Count
 P300 Enable
 P600 Enable
 Paper Motion Detect Enable
 Phase Fine Enable, Logic A4
 P/N 105777-001 through -003 *
 PI Disable
 Print Lowercase as Uppercase
 Skip over Perforation
 Underline Disable
 W8 and W9 both Installed = 10 lpi Only

3.0 CONFIGURATION

3.1 LOGIC PRINTED CIRCUITS BOARDS (Continued)

TABLE 3-6.
LOGIC PCBA A6, B9LOGIC PCBA A6, B9

8 lpi only
 9/10 lpi "E" Jumper Select
 Alternate Forms Length Select
 Automatic Line Feed
 CR-LF
 Data Bit 8 Disable
 Double Speed Plot
 Electronic Vertical Format Unit Disable
 Enables Ninth Dot Row
 Even Dot Plot Enable
 High Vertical Resolution Enabled for
 Location 3E.
 High Vertical Resolution Enabled for
 Location 1E.
 I/O Polarity
 Inverted Data Stroke
 Mod Plot
 Move One Line Binary Count
 P200 Enable
 P600 Enable
 Paper Motion Detect Enable
 Phase Fire Enable
 PI Disable
 Print Lowercase as Uppercase
 Skip over Perforation
 Underline Disable

3.0 CONFIGURATION

3.1 LOGIC PRINTED CIRCUIT BOARDS (Continued)

TABLE 3-7.
LOGIC PCAB A7, B10LOGIC PCBA A7, B10

8 lpi only
 9/10 lpi "E" Jumper Select
 Alternate Forms Length Select
 Alternate Compressed Print
 ✓ Automatic Line Feed
 Compressed Print
 ✓ CR=LF
 ✓ Data Bit 8 Disable
 ✓ Double Speed Plot
 Draft Mode Select
 ✓ Electronic Vertical Format Unit Disable
 Enables Ninth Dot Row
 ESR = 132
 Even Dot Plot Enable
 High Vertical Resolution Enabled for
 Location 6K.
 High Vertical Resolution Enabled for
 Location 6K.
 ✓ I/O Polarity
 Inverted Data Strobe
 Move One Line Binary Count
 P300 Enable
 P600 Enable
 ✓ Paper Motion Detect Enable
 Phase Fire Enable
 ✓ PI Disable
 ✓ Print Lowercase as Uppercase
 ✓ Skip over Perforation
 ✓ Underline Disable

3.0 CONFIGURATION

3.1.1 PCBA REMOVAL AND REPLACEMENT

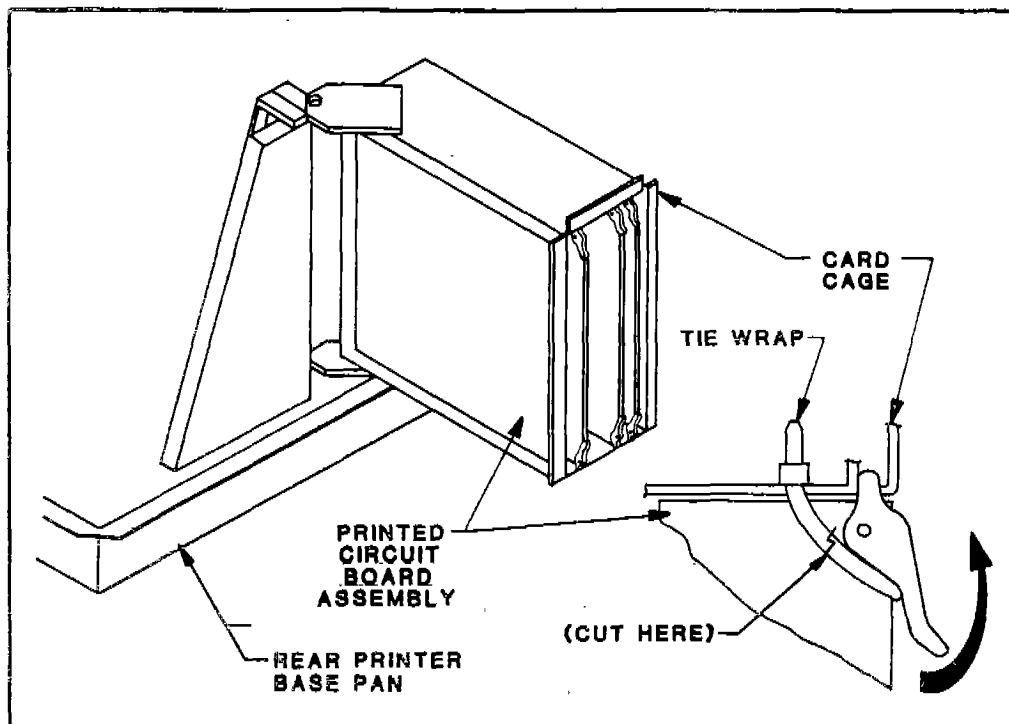
To proceed with configuration it is necessary to remove the appropriate A or B PCBA from the Printer Card Cage.

The Logic PCBAs may be removed from the card cage as follows:

TOOLS REQUIRED: 1 pair diagonal cutters

1. Disconnect the ac power cord.
2. Cut the tie wrap restraints on each PCBA referring to Figure 3-3.
3. Snap out the two white plastic ejection levers. This releases the PCBA from the rear edge connector.
4. Gently pull the PCBA from the card cage.

To replace PCBAs, reverse the above procedure. There is no need to replace the tie wrap restraints as they are needed for shipping only.



**FIGURE 3-3.
PCBA REMOVAL**

3.0 CONFIGURATION

3.2 HARDWARE CONFIGURATION

Hardware-selectable printer functions are configured by installing or removing hard-wired jumpers on the printer's Logic A and Logic B PCBAs. The logic PCBAs have one, two or three removable (14-pin) DIP platforms and/or on-board jumper points to which wires are soldered or removed.

TOOLS REQUIRED: Low wattage soldering iron
Needle nose pliers

● CAUTION ●

**ONLY PERSONNEL TRAINED IN SOLDERING TECHNIQUES
SHOULD PERFORM RECONFIGURATION. USE A LOW
POWERED IRON WHEN INSTALLING/REMOVING E-POINT
JUMPERS TO PREVENT DAMAGE TO THE CIRCUIT BOARD.**

Table 3-29 at the end of this section lists a summary of all hardware selectable functions, jumpers, PCBAs, and reference paragraphs. Sections 3.2.1 through 3.2.21 contain tables and descriptive paragraphs detailing these functions. Location of jumper platforms and jumper points are shown in Figures 3-4 through 3-6.

3.0 CONFIGURATION

3.2.1 ALTERNATE FORM LENGTH SELECT (FLS)

Install jumper between E8 and E9 on Logic B9 or B10 PCBA to select alternate form length of 12 inches. Omit jumper for standard 11 inch form length. The alternate 12 inch form length is not available on printers with Logic B4, B5 or B7 PCBA. This jumper does not effect the EVFU or Forms Length Selector switch option setting.

TABLE 3-8.
ALTERNATE FORMS LENGTH SELECT JUMPER

FUNCTION	PCBA	JUMPER	CONDITION	COMMENTS
Alternate Form Length = 12 inches Enable	B9, B10	E8 to E9	IN	

3.0 CONFIGURATION

3.2.2 CHARACTER HEIGHT SELECT

Install/omit jumpers as listed in Table 3-9 to select the desired character height. Character height is selectable only on printers with Logic A6/B9 and A7/B10 PCBAs.

TABLE 3-9.
CHARACTER HEIGHT SELECT JUMPERS

FUNCTION	PCBA	JUMPER	CONDITION	COMMENTS
7 Dot Rows	B9, B10	E1 to E2 E2 to E3	IN OUT	Standard Characters
8 Dot Rows	B9, B10	E1 to E2 E2 to E3	OUT IN	Required for OCR Character PROM.
9 Dot Rows	A7	W10	IN	Required for 8 dot row characters when Logic B7 PCBA or earlier is used. NOTE: E1 to E2 is a trace configured by manufacturer. To change a configuration, it is necessary to cut the trace.

3.0 CONFIGURATION

3.2.3 CHARACTER UNDERLINE ENABLE/DISABLE

To enable the Character Underline function, omit jumper W3 on all Logic A PCBAs. To disable Character Underline function, install jumper W3 on all Logic A PCBA. Character Underline function must be disabled if character code 5F hex (137 octal) is used for a special character in a PROM set.

TABLE 3-10.
CHARACTER UNDERLINE ENABLE/DISABLE

FUNCTION	PCBA	JUMPER	CONDITION	COMMENTS
Enable Character Underline	All Logic A	W3	OUT	
Disable Character Underline	All Logic A	W3	IN	

3.0 CONFIGURATION

3.2.4 CONTROL CODE SELECT

Table 3-11 lists available Compressed and Draft Character control codes. Compressed and Draft Characters are options not available on Logic A1, A2, A4, and A6 PCBAs. Install/omit jumpers on Logic A7 PCBA to select desired control code.

TABLE 3-11.
OPTIONAL COMPRESSED/DRAFT CHARACTERS CONTROL CODE JUMPERS

FUNCTION	HEX	OCTAL	PCBA	JUMPER	CONDITION	COMMENTS
Compressed Control Characters	01	001	A7	E5 to E7	IN	Standard Code
				E5 to E6	OUT	
	03	003	A7	E5 to E6 E5 to E7 E5 to E8 E9 to E6	IN OUT OUT OUT	Alternate Code
Draft Control Characters	09	011	A7	E5 to E8 E5 to E8 E5 to E7 E9 to E8	IN OUT OUT OUT	Alternate Code
	02	002	A7	E9 to E10 E9 to E6 E9 to E8	IN OUT OUT	Standard Code
	03	003	A7	E9 to E6 E9 to E10 E9 to E8 E5 to E6	IN OUT OUT OUT	Alternate Code
	09	011	A7	E9 to E8 E9 to E10 E9 to E8 E5 to E8	IN OUT OUT OUT	Alternate Code

3.0 CONFIGURATION

3.2.5 ELECTRONIC VERTICAL FORMAT UNIT (EVFU) ENABLE/DISABLE

Install W7 jumper on Logic B PCBA to disable the EVFU. Omit jumper W7 to enable normal EVFU operation.

TABLE 3-12.
EVFU ENABLE/DISABLE JUMPER

FUNCTION	PCBA	JUMPER	CONDITION	COMMENTS
EVFU Enable	All Logic B	W7	OUT	
EVFU Disable	All Logic B	W7	IN	

3.2.6 ELONGATED CHARACTERS SHIFT OUT

Install or omit jumpers listed in Table 3-13 to select normal or alternate control codes for Elongated Characters and SHIFT OUT functions.

TABLE 3-13.
ELONGATED CHARACTERS SHIFTOUT CONTROL CODE JUMPERS

FUNCTION	HEX	OCTAL	PCBA	JUMPER	CONDITION	COMMENTS
Elongated Characters	0B	010	A4, A6, A7	E1 to E2 E2 to E3	IN OUT	Normal Code
	0E	016		E1 to E2 E3 to E4	OUT IN	Centronics Code
Shift Out	0E	016	A4, A6, A7	E1 to E4 E3 to E4	OUT IN	Normal Code
	0B	010		E1 to E4 E3 to E4	IN OUT	Centronics Code

3.0 CONFIGURATION

3.2.7 ESR = 132 ENABLE

Available on the A7 PCBA only. Install W21 to enable automatic line feed when print buffer contains 132 characters. NOTE: Used in conjunction with W12, Automatic Line Feed.

TABLE 3-14.
ESR = 132 ENABLE

FUNCTION	PCBA	JUMPER	CONDITION	COMMENTS
ESR = 132 Enable	A7	W21	IN	

3.2.8 HIGH VERTICAL RESOLUTION CHARACTER PROM SOCKET SELECT

Install/omit jumper on Logic A6 or A7 PCBA (Table 3-15) to specify the main or alternate PROM socket for the high vertical resolution character PROM. Refer to Figure 3-6 for socket locations.

TABLE 3-15.
HIGH VERTICAL RESOLUTION CHARACTER PROM SOCKET JUMPERS

FUNCTION	PCBA	JUMPER	CONDITION	COMMENTS
Main Socket Location 3E	A6	W15	IN	Data Line 8 = low to select.
Alternate Socket Location 1E	A6	W15	OUT	Data Line 8 = high to select.
Main Socket Location 6K	A7	A6	OUT	Data Line 8 = low to select.
Alternate Socket Location 8K	A7	W6	IN	Data Line 8 = high to select.

3.0 CONFIGURATION

3.2.9 INTERFACE PARAMETERS SELECT

Install/omit jumpers on Logic A PCBA (Table 3-16) to select interface polarity (high or low True). The DATA STROBE edge (leading or trailing) enable/disable DATA LINE 8 and enable/disable the paper instruction (PI) signal. DATA STROBE inversion is not available on printers equipped with Logic A1 or A2 PCBA.

TABLE 3-16
INTERFACE PARAMETERS SELECT JUMPERS

FUNCTION	PCBA	JUMPER	CONDITION	COMMENTS
High True Interface	All Logic A	W2	IN	Affects all signals except Centronics DATA STROBE.
Low True Interface	All Logic A	W2	OUT	
Inverted DATA STROBE	A4, A6, A7	W2	IN	Relative to interface polarity.
Non-Inverted DATA STROBE	A4, A6, A7	W2	OUT	
Enable DATA LINE 8	All Logic A	W4	OUT	
Disable DATA LINE 8	All Logic A	W4	IN	
Enable PI	All Logic A	W5	OUT	Must be enabled to use Slew Relative function.
Disable PI	All Logic A	W5	IN	

3.0 CONFIGURATION

3.2.10 LINE SPACING SELECT

Install/omit jumpers on Logic B PCBA (Table 3-17) to select the desired line spacing. Note that jumper configuration varies according to the particular Logic B PCBA.

TABLE 3-17.
LINE SPACING SELECT JUMPERS

FUNCTION	PCBA	JUMPER	CONDITION	COMMENTS
6 and 8 lines per inch Spacing	B4	W9 W10 W13 W14 W15	IN OUT IN OUT OUT	Standard Configuration
	B5, B7	W8 W9	OUT OUT	
	B9, B10	W8 W9 E4 to E5	OUT OUT OUT	
6 and 9 lines per inch Spacing	B9, B10	W8 W9 E4 to E5	OUT IN IN	Operator panel 8 lpi switch: 6=6, 8=9. 8 lpi control code selects 9 lpi.
6 and 10 lines per inch Spacing	B4	W9 W10 W13 W14 W15	OUT IN OUT IN OUT	Operator Panel 8 lpi switch: 6=6, 8=10 lpi 8 lpi control code selects 10 lpi.
	B5, B7	W8 W9	OUT IN	
	B9, B10	W8 W9 E4 to E5	OUT IN OUT	
8 lpi only	B4	W9 W10 W13 W14 W15	IN OUT IN OUT IN	Operator Panel 8LPI switch not functional.
	B5, B7	W8 W9	IN OUT	
	B9, B10	W8 W9 E4 to E5	IN OUT OUT	
9 lpi only	B9, B10	W8 W9 E4 to E5	IN OUT IN	Operator Panel 8LPI switch not functional.
10-lpi only	B4	W9 W10 W13 W14 W15	OUT IN OUT IN IN	Operator panel 8LPI switch not functional.
	B5, B7	W8 W9	IN IN	
	B9, B10	W8 W9 E4 to E5	IN IN OUT	

3.0 CONFIGURATION

3.2.11 LINE FEED CONTROL SELECT

As shown in Table 3-18 install/omit jumpers on Logic A PCBA to specify automatic line feed on receipt of carriage return, buffer full or host computer controlled line feed.

The number of characters which cause a buffer full automatic line feed varies according to the print type selected. Install jumper W21 to fix the buffer full condition at 132 characters. Omit jumper W21 to allow automatic line feed when the print line is full. Compressed print type allows 220 characters to be printed on 15 inch width paper before automatic line feed.

TABLE 3-18.
LINE FEED CONTROL JUMPERS

FUNCTION	PCBA	JUMPER	CONDITION	COMMENTS
Carriage Return = Line Feed	All Logic A	W2	IN	Auto LF when CR.
		W13	OUT	Disables underline, add, and delete functions. CR, LF sequence causes double LF.
Carriage Return ≠ Line Feed	All Logic A	W2	OUT	Host must send LF. Allows underline, add, and delete function.
		W13	OUT	
Printer Line Buffer Full = Line Feed	All Logic A	W12	IN	Auto LF when printer buffer full. Add pad characters, if necessary, to fill buffer.
Printer Line Buffer Full Line Feed ≠	All Logic A	W12	OUT	Host must send LF.

3.0 CONFIGURATION

3.2.12 MODIFIED PLOT

Install jumper between E6 and E7 on Logic B7, B9, and B10 PCBA to eliminate the necessity of an extra line feed when exiting Plot Mode and entering Character Print Mode.

NOTE: This jumper may shift line registration by a number of dot rows. When using existing software it may be necessary to eliminate the extra line feed codes.

TABLE 3-19.
MODIFIED PLOT JUMPER

FUNCTION	PCBA	JUMPER	CONDITION	COMMENTS
Modified Plot	B7, B9, B10	E6 to E7	IN	

3.2.13 MOVE 1 LINE BINARY COUNT SELECT

This function allows matching the printer binary count system to host computer binary count system.

Install jumper W12 on Logic B5, B9 or B10 PCBA to move paper 1 line with binary count of 0000. Omit jumper W12 to move paper 1 line with a binary count of 0001. The move 1 line count function is not selectable with Logic B4 PCBA.

TABLE 3-20.
BINARY COUNT SELECT JUMPERS

FUNCTION	PCBA	JUMPER	CONDITION	COMMENTS
Binary 0000 = Move 1 line	B5, B9, B10	W12	IN	
Binary 0001 = Move 1 line	B5, B9, B10	W12	OUT	

3.0 CONFIGURATION

3.2.14 MULTI-MODE PRINT SELECT

Install/omit jumpers on Logic A7 PCBA on printers with optional Draft/Compressed character styles, as shown in Table 3-21 to alter the system default. System default determines the print style which will be printed if no control code is received from the host computer. To operate the multi-mode option described in Section 2.5.3, no jumpers need to be installed

TABLE 3-21.
MULTI-MODE PRINT SELECT JUMPERS

FUNCTION	PCBA	JUMPER	CONDITION	COMMENTS
Normal Print	A7	W17 W18	OUT OUT	132 characters per line (10 cpi).
Draft Print	A7	W17 W18	IN OUT	132 characters per line (10 cpi).
Compressed Print	A7	W17 W18	OUT IN	P600=198 characters per line (15 cpi) P300=220 characters per line (16.7 cpi).
Alternate Compressed Print (P-300 only)	A7	W19	IN	176 character per line (13.3 cpi).

3.0 CONFIGURATION

3.2.15 PAPER FAULT OPERATION SELECT

Install/omit jumpers on Logic B PCBA (Table 3-22) to select printer operation when a paper out fault is detected.

TABLE 3-22.
PAPER FAULT OPERATION SELECT

FUNCTION	PCBA	JUMPER	CONDITION	COMMENTS
Stop Immediately Upon Paper Fault	B4	W27 W28 W10 W11	IN OUT IN OUT	
	B5, B7	F1 to F2	IN	
	B7	E12 to E13	IN	
	B9, B10	E13 to E14	OUT	
Stop 12 Lines After Fault	B4	W27 W28 W10 W11	OUT IN OUT IN	
	B5, B7	F1 to F2	OUT	
	B9, B10	E13 to E14	IN	

3.2.16 PAPER MOTION DETECTOR ENABLE/DISABLE

Install on Logic B PCBA jumper W6 to enable the printer's paper motion detector. Omit jumper W6 to disable the detector when using colored paper that interferes with printer operation.

TABLE 3-23.
PAPER MOTION DETECTOR JUMPERS

FUNCTION	PCBA	JUMPER	CONDITION	COMMENTS
Paper Motion Detection Enable	All Logic B	W6	IN	
Paper Motion Detection Disable	All Logic B	W6	OUT	

3.0 CONFIGURATION

3.2.17 PHASE FIRE ENABLE SELECT

P-600 printers with serial number C31579 and greater, require installation of W1 on Logic A4 PCBA (P/N 105777), Logic A6 PCBA, and Logic A7 PCBA.

Each A and B PCBA is identified in writing on the lower rear edge of the board.

TABLE 3-24.
PHASE FIRE ENABLE JUMPERS

FUNCTION	PCBA	JUMPER	CONDITION	COMMENTS
P600 Phase Fire Enable	A4	W1	IN	P/N 105777 only
	A6, A7	W1	IN	

3.2.18 PLOT MODE PARAMETERS SELECT

Install/omit jumpers on Logic A and B PCBAs (Table 3-25) to select plot mode operating parameters.

TABLE 3-25.
PLOT MODE PARAMETERS SELECT JUMPERS

FUNCTION	PCBA	JUMPER	CONDITION	COMMENTS
Even (Half) Dot Plot Enable	A2, A4, A6, A7	W9	IN	Required for high resolution graphics.
Even (Half) Dot Plot Disable	A2, A4, A6, A7	W9	OUT	Even Dot Plot not available on printers with A1 PCBA.
Normal Speed Plot	All Logic B	W4	OUT	
Double Speed Plot	All Logic B	W4	IN	25% hammer duty cycle.

● CAUTION ●

BEFORE CONFIGURING FOR DOUBLE SPEED PLOT MODE, SEE SECTION 4.2.2 TO AVOID DAMAGE TO THE PRINTER.

3.0 CONFIGURATION

3.2.19 PRINT LOWERCASE AS UPPERCASE ENABLE/DISABLE

Install jumper W6 on Logic A PCBA to print corresponding uppercase characters when lowercase character codes are received. Omit jumper W6 when lowercase character PROMs are installed.

TABLE 3-26.
PRINT LOWERCASE AS UPPERCASE

FUNCTION	PCBA	JUMPER	CONDITION	COMMENTS
Print Lowercase as Uppercase Enable	All Logic A	W6	IN	
Print Lowercase as Uppercase Disable	All Logic A	W6	OUT	

3.0 CONFIGURATION

3.2.20 PRINTER MODEL SELECT

Install/omit jumpers on both Logic A and Logic B PCBAs (Table 3-27) to configure a PCBA for a printer model. Note that jumper placement varies with the particular logic boards used. Logic A1 and B4 PCBA can be used with P-300 printers only.

TABLE 3-27.
PRINTER MODEL SELECT JUMPERS

FUNCTION	PCBA	JUMPER	CONDITION	COMMENTS
P300 Model	A2	W14	OUT	*W14 is out when High Vertical Resolution option is utilized.
	A4, A6, A7	W11	IN	
		W14	OUT	
	B5	W13	IN	
	B7,	W5	OUT	
		W11	IN	
		W13	IN	
		W14*	IN	
	B9, B10	W5	OUT	
		W11	IN	
		W13	IN	
		W14	OUT	
P600 Model	A4, A6, A7	W11	OUT	
		W14	OUT	
	B7, B9, B10	W5	IN	
		W10	OUT	
		W11	IN	
		W13	IN	
		W14	OUT	

3.0 CONFIGURATION

3.2.21 SKIP OVER PERFORATION LENGTH SELECT

Install/omit jumpers on all Logic B PCBA (Table 3-28) to specify the number of non-printable lines before the paper perforation. This function prevents the printing of characters on the paper perforation. It is automatically deactivated when the EVFU is loaded or Forms Length Selector option is installed. Note that the number of lines skipped varies with the line spacing selected.

TABLE 3-28.
SKIP OVER PERFORATION LENGTH SELECT JUMPERS

LINES SKIPPED				ALL LOGIC B PCBA JUMPERS		
6 lpi	8 lpi	9 lpi	10 lpi	W1	W2	W3
6	8	9	10	OUT	OUT	IN
5	6	7	8	IN	OUT	IN
4	5	6	6	OUT	IN	IN
3	4	4	5	IN	IN	IN
0	0	0	0	OUT	OUT	OUT

3.3 OPTIONAL/CUSTOM CHARACTER PROMs

As shown in Figures 3-4 through 3-6, the Logic A board contains sockets for a Main character PROM(s) and an Alternate character PROM(s). PROM locations vary depending on the Logic A version.

The Main character PROM is normally shipped with all P-Series printers and provides the standard 96 ASCII characters and symbols.

The Alternate character PROM location(s) are provided for optional or custom character PROM sets that may be installed or replaced by the user.

Note that some optional and custom character PROM sets may require printer reconfiguration, e.g. OCR high resolution.

Optional character set PROMs including OCR A and B sets, math symbols, gray scale characters, block characters, APL, EBCDIC, and scientific super and subscripts, are available from Printronix. Optional character sets are described in the PROM Character Set Manual available from Printronix Customer Service.

Custom character sets may be ordered from Printronix.

Section 4.0 describes use of programming control codes to select characters from the alternate PROMs.

3.0 CONFIGURATION

3.4 SUMMARY OF HARDWARE SELECTABLE FUNCTIONS

Table 3-29 is a summary of hardware selectable functions and associated jumpers for all versions of Logic A and Logic B PCBAs. Location of jumper platforms and jumper points are shown in Figures 3-4 through 3-6.

TABLE 3-29.
HARDWARE SELECTABLE PRINTER FUNCTION JUMPERS

FUNCTION	LOGIC PCBA	JUMPER	JUMPER CONDITION	PARAGRAPH REFERENCE
◊ CHARACTER HEIGHT				3. 2. 16
7 Dot Rows	A6, A7	W10	OUT	
	B9, B10	E1-E2	IN	
	B9, B10	E2-E3	OUT	
8 Dot Rows	A6, A7	W10	OUT	
	B9, B10	E1-E2	OUT	
	B9, B10	E2-E3	IN	
9 Dot Rows	A6, A7	W10	IN	
◊ ALTERNATE COMPRESSED SELECT (P300 only)				3. 2. 14
13.3 cpi (176 characters per line)				
16.7 cpi (220 Characters per line)	A7	W19	IN	
	A7	W19	OUT	
◊ ALTERNATE FORM LENGTH SELECT				3. 2. 17
Standard	B9, B10	E8-E9	OUT	
Alternate	B9, B10	E8-E9	IN	

3.0 CONFIGURATION

3.4 SUMMARY OF HARDWARE SELECTABLE FUNCTIONS (Continued)

TABLE 3-29.
HARDWARE SELECTABLE PRINTER FUNCTION JUMPERS

FUNCTION	LOGIC PCBA	JUMPER	JUMPER CONDITION	PARAGRAPH REFERENCE
◇ CONTROL CODE SELECT				3.4.3
Compressed Characters, Standard Code = 01 HEX	A7	E5-E7	IN	
	A7	E5-E6	OUT	
		E5-E8	OUT	
		E9-E7	OUT	
Compressed Characters Alternate Code = 03 HEX	A7	E5-E6	IN	
		E5-E7	OUT	
		E9-E6	OUT	
		E5-E8	OUT	
Compressed Characters Alternate Code = 09 HEX	A7	E5-E8	IN	
		E5-E6	OUT	
		E5-E7	OUT	
		E9-E8	OUT	
Draft Characters Standard Code = 02 HEX	A7	E9-E10	IN	
		E9-E6	OUT	
		E9-E8	OUT	
		E5-E10	OUT	
Draft Characters Alternate Code = 03 HEX	A7	E9-E6	IN	
		E9-E10	OUT	
		E5-E6	OUT	
		E9-E8	OUT	
Draft Characters Alternate Code = 09 HEX	A7	E9-E8	IN	
		E9-E10	OUT	
		E9-E6	OUT	
		E5-E8	OUT	
Elongated Characters Normal Code = 08 HEX	A4, A6, A7	E1-E2	IN	
		E2-E3	OUT	

3.0 CONFIGURATION

3.4 SUMMARY OF HARDWARE SELECTABLE FUNCTIONS (Continued)

TABLE 3-29.
HARDWARE SELECTABLE PRINTER FUNCTION JUMPERS

FUNCTION	LOGIC PCBA	JUMPER	JUMPER CONDITION	PARAGRAPH REFERENCE
♦ CONTROL CODE SELECT (Continued)				3.4.3
Elongated Characters Centronics Code = 0E HEX	A4, A6, A7	E1-E2 E2-E3	OUT IN	
Shift Out Normal Code = 0E HEX	A4, A6, A7	E1-E4 E3-E4	OUT IN	
Shift Out Centronics Code = 0B HEX	A4, A6, A7	E1-E4 E3-E4	IN OUT	
♦ ELECTRONIC VERTICAL FORMAT UNIT (EVFU)				3.2.7
Enable	B4, B5, B7	W7	OUT	
Disable	B4, B9, B10	W7	IN	
♦ HIGH VERTICAL RESOLUTION CHARACTER SOCKET				3.2.18
Main	A6, A7	W15 W16	IN OUT	
Alternate	A6, A7	W16	IN	
♦ INTERFACE PARAMETERS	A1, A2, A4 A6, A7			3.2.3
High True		W7	OUT	
Low True		W7	IN	
Inverted Data Strobe Edge		W2	IN	
Non-Inverted Data Strobe Edge		W2	OUT	
Data Bit 8 Enable		W4	OUT	
Data Bit 8 Disable		W4	IN	
PI Enable		W5	OUT	
PI Disable		W5	IN	

3.0 CONFIGURATION

3.4 SUMMARY OF HARDWARE SELECTABLE FUNCTIONS (Continued)

TABLE 3-29.
HARDWARE SELECTABLE PRINTER FUNCTION JUMPERS

FUNCTION	LOGIC PCBA	JUMPER	JUMPER CONDITION	PARAGRAPH REFERENCE
◊ LINE FEED CONTROL				3.2.1
Carriage Return = Line Feed	A1, A2 A4, A6, A7	W2 W13	IN IN	
Carriage Return = Line Feed	A1, A2 A4, A6, A7	W2 W13	OUT OUT	
Printer Line Buffer Full = Line Feed	A1, A2 A4, A6, A7	W1 W12	IN IN	
Printer Line Buffer Full Line Feed	A1, A2 A4, A6, A7	W1 W12	OUT OUT	
Buffer Full at 132 Characters Enable		W21*	IN	
Disable	A7	W21	OUT	3.2.15
* Use in conjunction with W12.				
◊ LINE SPACING SELECT				3.2.8
6 and 8 Lines	B4	W9, W13	OUT	
	B4	W10, W14, W15	OUT	
	B5, B7	W8, W9	OUT	
	B9, B10	W8, W9, E4-E5	OUT OUT	
6 and 9 Lines	B4	N/A		
	B5, B7	N/A		
	B9, B10	W8, W9, E4-E5	OUT IN	
6 and 10 Lines	B4	W10, W14	IN	
	B4	W9, W13, W15	OUT	
	B5, B7	W9	IN	
	B9, B10			
	B5, B7	W8	OUT	
	B9, B10			
	B9, B10	E4-E5	OUT	

3.0 CONFIGURATION

3.4 SUMMARY OF HARDWARE SELECTABLE FUNCTIONS (Continued)

TABLE 3-29.
HARDWARE SELECTABLE PRINTER FUNCTION JUMPERS

FUNCTION	LOGIC PCBA	JUMPER	JUMPER CONDITION	PARAGRAPH REFERENCE
◊ LINE SPACING SELECT (Continued)				3.2.8
8 Lines only	B4	W9, W13, W15	IN	
	B4	W10, W14	OUT	
	B5, B7	W8	IN	
	B9, B10	W8	IN	
	B9, B10	W9, E4-E5	OUT	
9 Lines only	B4	N/A		
	B5, B7	N/A		
	B9, B10	W8	IN	
		W9	OUT	
		E4-E5	IN	
10 Lines only	B4	W10, W14, W15	IN	
	B4	W9, W13	OUT	
	B5, B7	W8, W9	IN	
	B9, B10	W8, W9	IN	
	B9, B10	E4-E5	OUT	
◊ MOVE 1 LINE BINARY				3.2.11
Binary Count 0000	B5, B7, B9, B19	W12	IN	
Binary Count 0001	B5, B7, B9, B10	W12	OUT	
◊ MULTI-MODE PRINT				3.2.14
Normal Printing	A7	W17, W18	OUT	
Draft	A7	W17	IN	
	A7	W18	OUT	
Compressed	A7	W17	OUT	
	A7	W18	IN	
◊ COMPRESSED PRINT	A7	W19	OUT	3.2.14
Compressed (P300 only)	A7	W19	IN	

3.0 CONFIGURATION

3.4 SUMMARY OF HARDWARE SELECTABLE FUNCTIONS (Continued)

TABLE 3-29.
HARDWARE SELECTABLE PRINTER FUNCTION JUMPERS

FUNCTION	LOGIC PCBA	JUMPER	JUMPER CONDITION	PARAGRAPH REFERENCE
◊ PAPER FAULT OPERATION SELECT Stop Immediately Upon Fault	B4 B4 B4 B4 B5, B7 B9, B10	W27 W28 W10 W11 F1-F2 E13-E14	IN OUT IN OUT IN OUT	3. 2. 9
Stop 12 Lines After Fault	B4 B4 B4 B4 B5, B7 B9, B10	W27 W28 W10 W11 F1-F2 E13-E14	OUT IN OUT IN OUT IN	
◊ PAPER MOTION DETECTOR Enable	B4, B5, B7 B9, B10	W6	IN	3. 2. 6
Disable		W6	OUT	
◊ PHASE FIRE Enable	A4*, A6, A7	W1	IN	3. 2. 13
Disable * P/N 105777 only.		W1	OUT	
◊ PLOT MODE OPERATING PARAMETERS Even (Half) Dot Plot Enable	A2, A4, A6, A7	W9	IN	3. 2. 10
Disable		W9	OUT	
Normal Speed Plot	B4, B5, B7 B9, B10	W4	OUT	
Double Speed Plot		W4	IN	
◊ PRINT LOWERCASE AS UPPERCASE Enable	A1, A2, A4 A6, A7	W6	IN	3. 2. 4
Disable		W6	OUT	

3.0 CONFIGURATION

3.4 SUMMARY OF HARDWARE SELECTABLE FUNCTIONS (Continued)

TABLE 3-29.
HARDWARE SELECTABLE PRINTER FUNCTION JUMPERS

FUNCTION	LOGIC PCBA	JUMPER	JUMPER CONDITION	PARAGRAPH REFERENCE
◊ PRINTER MODEL SELECT				3.2.12
P300	A2	W14	OUT	
	A4, A6, A7	W11	IN	
	A4, A6, A7	W14	OUT	
* W14 must be out when the High Vertical Resolution Option is used.	B5	W13	IN	
	B7, B9, B10	W5, W10	OUT	
	B7, B9, B10	W11, W13,	IN	
	B7	W14*	IN*	
	B9, B10	W14	OUT	
P600	A2	W14	N/A	
	A6, A7	W11, W14	OUT	
	B5	W13	N/A	
	B7, B9, B10	W5, W11,	IN	
		W13		
	B7, B9, B10	W10, W14	OUT	
◊ SKIP OVER PERFORATION				3.2.5
Lines Skipped				
6lpi 8lpi 9lpi 10lpi				
0 0 0 0	B4, B5, B7	W1, W2, W3	OUT	
3 4 4 5	B9, B10	W1, W2, W3	IN	
4 5 6 6		W1	OUT	
		W2, W3	IN	
5 6 7 8		W1, W3	IN	
		W2	OUT	
6 8 9 10		W1, W2	OUT	
		W3	IN	
◊ UNDERLINE				3.2.2
Enable	A1, A2, A4	W3	OUT	
Disable	A6, A7	W3	IN	

3.0 CONFIGURATION

3.4 SUMMARY OF HARDWARE SELECTABLE FUNCTIONS (Continued)

LOGIC PCBA A1,B4

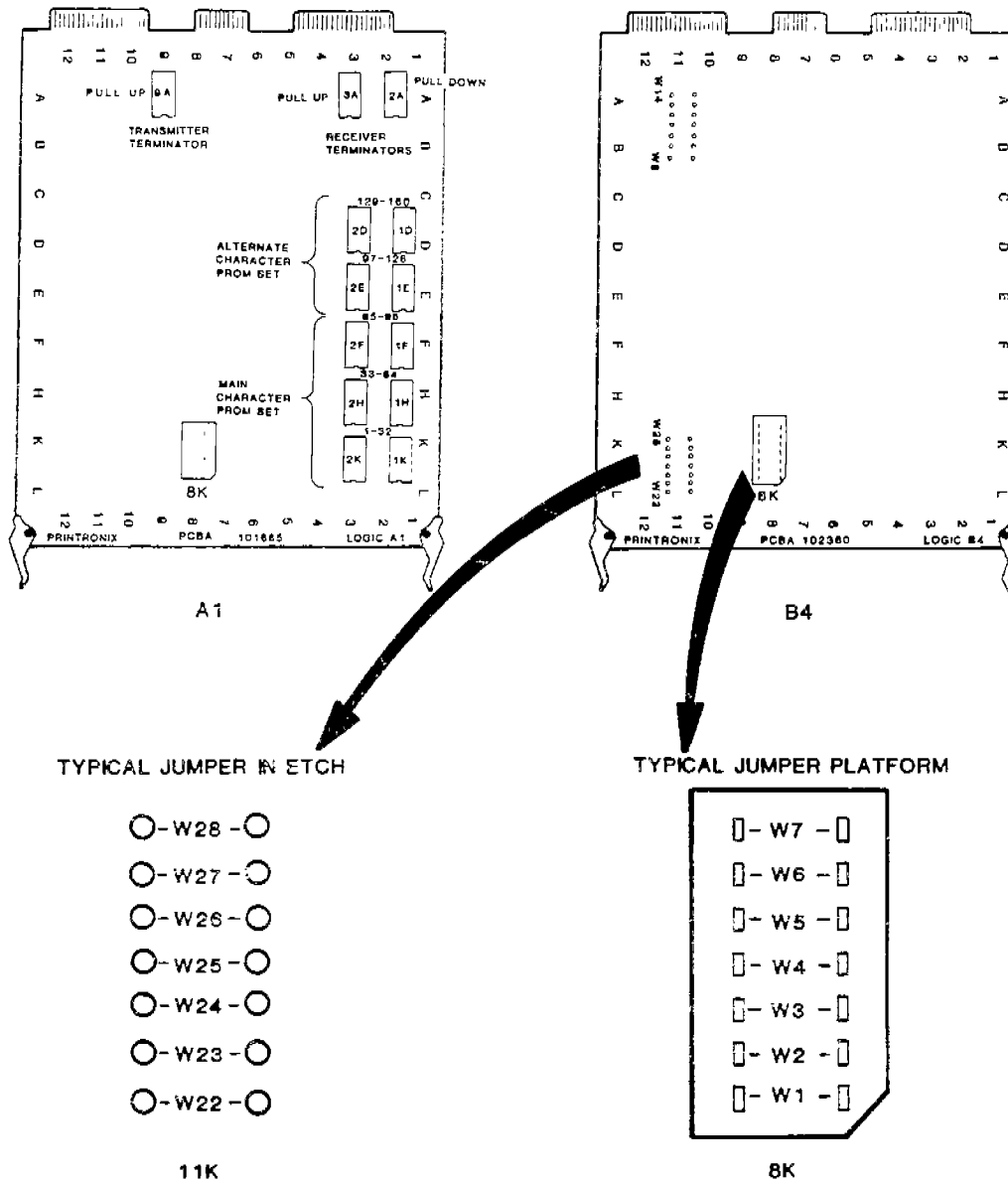
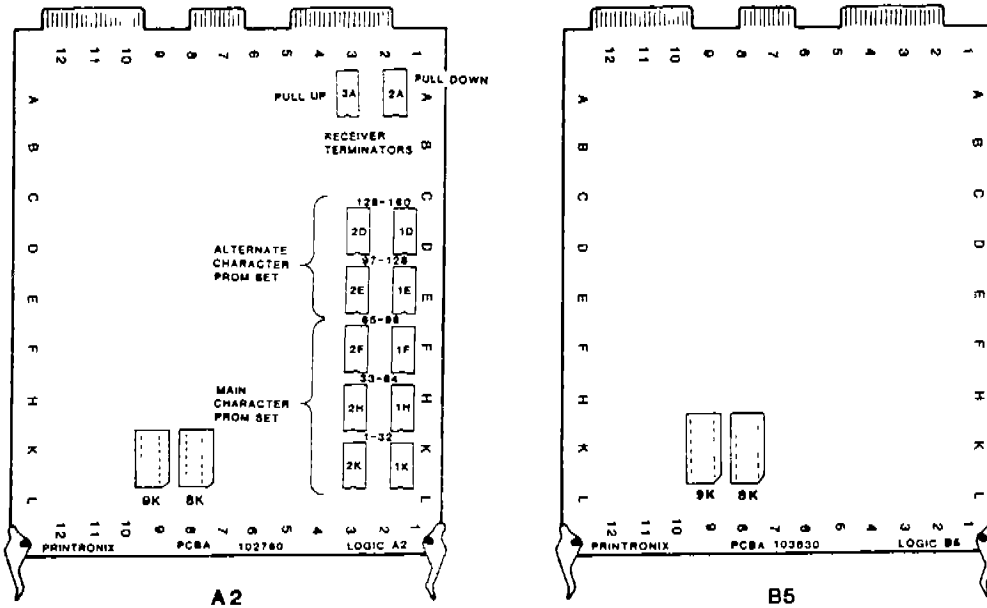


FIGURE 3-4

3.0 CONFIGURATION

3.4 SUMMARY OF HARDWARE SELECTABLE FUNCTIONS (Continued)

LOGIC PCBA A2, B5



LOGIC PCBA A4, B7

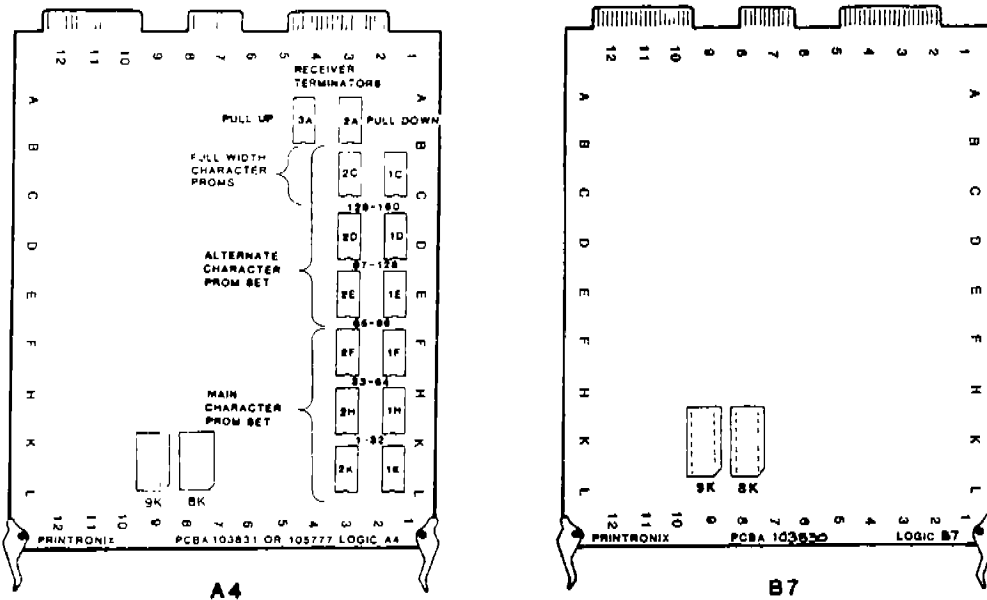


FIGURE 3-5

3.0 CONFIGURATION

3.4 SUMMARY OF HARDWARE SELECTABLE FUNCTIONS (Continued)

LOGIC PCBA A6,B9

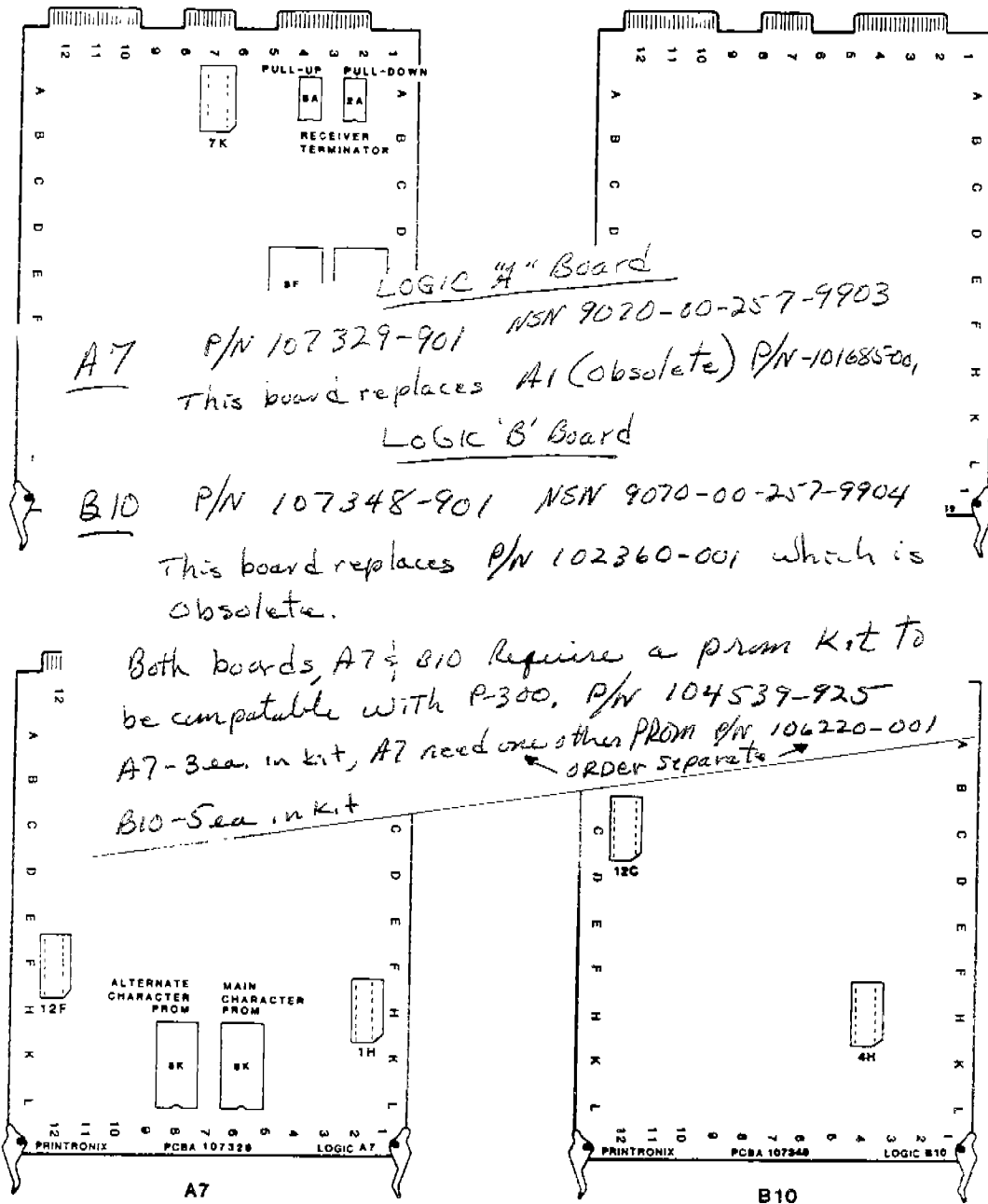


FIGURE 3-6

PROGRAMMING

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Plot Mode	4.2
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Slew Relative Programming	4.4

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4.0 PROGRAMMING

The Programming Section describes the function and operation of program control codes recognized by P-Series printers. These codes sent from the host computer control various printer functions. Print mode, print type, character selection, paper position and EVFU parameters are typical functions selected by control codes.

Discussion of programming is divided into two basic categories: Character Print Mode programming and Plot Mode programming.

- CHARACTER PRINT MODE - or simply Print Mode, creates standard or alternate alphanumeric characters generated from printer PROM sets.
- PLOT MODE - creates graphics and/or characters generated by host computer dot addressed data.

Character Print Mode is the P-Series default mode unless otherwise configured. Plot Mode is selected by host computer control codes (refer to Section 3.0) inserted into the data stream.

The P-Series host controlled functions and options, corresponding control codes and section reference paragraphs are listed in Table 4-1. Table 4-2 lists the standard 96 ASCII character set and their corresponding control codes in binary, octal, decimal, and hexadecimal.

Plot Mode format and control codes are described in Section 4.2. Methods of combining graphics and characters on the same page are described in Section 4.2.6.

Electronic Vertical Format Unit (EVFU) operation and control codes are described in Section 4.3.

Slew Relative programming and operation information is detailed in Section 4.4.

The Intelligent Graphics Processor option information is contained in the IGP-10 User's Reference Manual.

4.0 PROGRAMMING

TABLE 4-1.
P-SERIES PRINTER CONTROL CODES

PRINTER FUNCTION	CONTROL CODE				REFERENCE PARAGRAPH
	Hex	Octal	Decimal	ASCII Key	
8 lpi Spacing	06	006	06	^F	4.1.9
Alternate Character Select (Shift In)	0F	017	15	^D	4.1.13
Alternate Character Select (Shift Out)	*0E	016	14	^N	4.1.13
Carriage Return	0D	015	13	^M	4.1.5
+Compressed Characters	*01	001	03	^A	4.1.3
Dot Plot, Even	04	004	04	^D	4.2
Dot Plot, Odd	05	005	05	^E	4.2
+Draft Characters	*02	002	02	^B	4.1.2
Delete	7F	177	127	delete	4.2.12
Elongated Characters	*08	010	08	^H	4.1.4
EVFU, Start	1E	036	30		4.4.2
EVFU Channel 1	10	020	16	^P	4.4.2
EVFU Channel 2	11	021	17	^Q	4.4.2
EVFU Channel 3	12	022	18	^R	4.4.2
EVFU Channel 4	13	023	19	^S	4.4.2
EVFU Channel 5	14	024	20	^T	4.4.2
EVFU Channel 6	15	025	21	^U	4.4.2
EVFU Channel 7	16	026	22	^V	4.4.2
EVFU Channel 8	17	027	23	^W	4.4.2
EVFU Channel 9	18	030	24	^X	4.4.2
EVFU Channel 10	19	031	25	^Y	4.4.2
EVFU Channel 11	1A	032	26	^Z	4.4.2
EVFU Channel 12	1B	033	27	^[	4.4.2
EVFU Channel 13	1C	034	28	^\	4.4.2
EVFU Channel 14	1D	035	29		4.4.2
EVFU Load, End	1F	037	31		4.4.2
Form Feed	0C	014	12	^L	4.1.8
Line Feed	0A	012	10	^J	4.1.6
Space	20	040	32	Space Bar	4.1.11
Underline	5F	137	95		4.1.10
Vertical Tab	0B	013	11	^K	4.1.7

* Alternate control code can be assigned.

+ Option present only on printers with Logic A7, B10 PCBAs.

4.0 PROGRAMMING

TABLE 4-2.
STANDARD ASCII CHARACTER SET AND CONTROL CODES

The standard set of 96 ASCII characters and their corresponding codes in binary, octal, decimal, and hexadecimal are listed below.

ASCII	Binary	Oct	Dec	Hex
Space	0100000	040	32	20
!	0100001	041	33	21
"	0100010	042	34	22
#	0100011	043	35	23
\$	0100100	044	36	24
%	0100101	045	37	25
&	0100110	046	38	26
'	0100111	047	39	27
(	0101000	050	40	28
)	0101001	051	41	29
*	0101010	052	42	2A
+	0101011	053	43	2B
,	0101100	054	44	2C
-	0101101	055	45	2D
.	0101110	056	46	2E
/	0101111	057	47	2F
0	0110000	060	48	30
1	0110001	061	49	31
2	0110010	062	50	32
3	0110011	063	51	33
4	0110100	064	52	34
5	0110101	065	53	35
6	0110110	066	54	36
7	0110111	067	55	37
8	0111000	070	56	38
9	0111001	071	57	39
:	0111010	072	58	3A
;	0111011	073	59	3B
<	0111100	074	60	3C
=	0111101	075	61	3D
>	0111110	076	62	3E
?	0111111	077	63	3F

ASCII	Binary	Oct	Dec	Hex
@	1000000	100	64	40
A	1000001	101	65	41
B	1000010	102	66	42
C	1000011	103	67	43
D	1000100	104	68	44
E	1000101	105	69	45
F	1000110	106	70	46
G	1000111	107	71	47
H	1001000	110	72	48
I	1001001	111	73	49
J	1001010	112	74	4A
K	1001011	113	75	4B
L	1001100	114	76	4C
M	1001101	115	77	4D
N	1001110	116	78	4E
O	1001111	117	79	4F
P	1010000	120	80	50
Q	1010001	121	81	51
R	1010010	122	82	52
S	1010011	123	83	53
T	1010100	124	84	54
U	1010101	125	85	55
V	1010110	126	86	56
W	1010111	127	87	57
X	1011000	130	88	58
Y	1011001	131	89	59
Z	1011010	132	90	5A
[	1011011	133	91	5B
\	1011100	134	92	5C
]	1011101	135	93	5D
^	1011110	136	94	5E
_	1011111	137	95	5F

ASCII	Binary	Oct	Dec	Hex
	1100000	140	96	60
a	1100001	141	97	61
b	1100010	142	98	62
c	1100011	143	99	63
d	1100100	144	100	64
e	1100101	145	101	65
f	1100110	146	102	66
g	1100111	147	103	67
h	1101000	150	104	68
i	1101001	151	105	69
j	1101010	152	106	6A
k	1101011	153	107	6B
l	1101100	154	108	6C
m	1101101	155	109	6D
n	1101110	156	110	6E
o	1101111	157	111	6F
p	1110000	160	112	70
q	1110001	161	113	71
r	1110010	162	114	72
s	1110011	163	115	73
t	1110100	164	116	74
u	1110101	165	117	75
v	1110110	166	118	76
w	1110111	167	119	77
x	1111000	170	120	78
y	1111001	171	121	79
z	1111010	172	122	7A
{	1111011	173	123	7B
|	1111100	174	124	7C
}	1111101	175	125	7D
~	1111110	176	126	7E
Delete	1111111	177	127	7F

ODD DOT PLOT USES ODD-NUMBERED POSITIONS
EVEN DOT PLOT USES EVEN-NUMBERED POSITIONS

4.0 PROGRAMMING

4.1 CHARACTER PRINT MODE

P-Series printers receive data from the host computer as a series of character lines when functioning in the Character Print Mode. Each line consists of alphanumeric characters, space characters, symbols, and control codes.

Character lines must end with a line terminator code. Terminator codes are line feed, form feed or vertical tab. A line terminator code causes the contents of the 132 character line buffer (which constitutes the received line) to be printed and advances paper to the next print position.

NOTE: The printer can be configured for an automatic line terminator, eliminating the necessity of a line terminator code. Refer to Section 3.2.1.

Sections 4.1.1 through 4.1.13 describe and illustrate Print Mode functions, print types (data processing, draft, and compressed), and their respective hexadecimal control codes.

4.1.1 DATA PROCESSING PRINT

The Data Processing Print shown in Figure 4-1 is the P-Series default print. No control code is required to select Data Processing print. The standard 132 character line buffer is used with Data Processing print.

THE FOLLOWING REPORT WAS PRINTED IN THE DATA PROCESSING MODE.

* FORECAST BY REGION , ACME GADGET , INC.

SALES IN (000)

13.2"												
REGION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ATLANTIC	284	91	127	163	142	138	162	193	200	243	266	309
GREAT LAKE	173	119	150	148	173	165	189	202	229	240	278	260
MOUNTAIN	710	543	410	390	351	390	417	480	508	535	580	603
SOUTHWEST	160	82	106	78	102	120	143	135	150	165	188	210
PACIFIC	400	250	278	270	295	316	325	400	425	450	503	515
TOTAL	1727	1085	1071	1049	1063	1129	1236	1410	1512	1633	1815	1897

----- FORM SIZE 15.0 INCHES -----

FIGURE 4-1.
DATA PROCESSING PRINT

4.0 PROGRAMMING

4.1.2 DRAFT PRINT (OPTIONAL) (02 HEX)

The optional Draft character control code (02 hex) specifies low density (9x5 dot matrix) characters. Only uppercase characters are printed in draft mode. Lowercase character data received by the printer is automatically converted and printed as uppercase. Draft characters are printed 25% faster than normal and occupy the same space as normal Data Processing characters, i.e., 132 characters per line, 10 characters per inch.

The Draft character control code can be placed anywhere before the line terminator code in each line of characters using Draft print. After the line terminator code is received, the default print type is automatically reselected. The Elongated character control code placed in a line with the Draft character control code will produce Elongated-Draft characters.

The Multi-Mode switch, located inside the cover specifies the default print type. Configuration jumpers on Logic A7 PCBA can also be used to establish the default print type and select an alternate control code for Draft Characters.

THE SAME REPORT PRINTED IN THE HIGH SPEED DRAFT MODE

* FORECAST BY REGION , ACME GADGET , INC.

SALES IN (000)

13.2"												
REGION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ATLANTIC	234	91	127	163	142	136	162	193	200	243	266	309
GREAT LAKE	173	119	150	143	173	165	139	202	229	240	278	260
MOUNTAIN	710	543	410	390	351	390	417	430	508	535	580	603
SOUTHWEST	160	82	104	76	102	120	143	135	150	165	188	210
PACIFIC	400	250	278	270	295	316	325	400	425	450	503	515
TOTAL	1757	1095	1071	1049	1063	1129	1236	1410	1512	1633	1815	1897

[-----FORM SIZE 15.0 INCHES-----]

FIGURE 4-2.
DRAFT PRINT

4.0 PROGRAMMING

4.1.3 COMPRESSED PRINT (OPTIONAL) (01 HEX)

The optional Compressed character control code (01 hex) specifies a character of increased pitch. The pitch of Compressed print for the P-300 is either 176 or 220 characters per line. The P-600 compressed pitch is 198 characters per line.

NOTE: When using P-600 Compressed Print a 132 character line (13.2 inches) is compressed to 8.8 inches. Therefore, printing on 11 inch width paper is recommended.

The Compressed character control code must be inserted before the 132nd character of the line to prevent data loss. After the line terminator code is received, the default print mode is automatically reselected. The Elongated control code and the Compressed control code placed in the same line will produce Elongated-Compressed characters.

THE SAME DATA CAN BE PRINTED ON AN 8.5 x 11 INCH FORM BY SELECTING COMPRESSED PRINT (P300)

* FORECAST BY REGION, ACME GADGET, INC. SALES IN ('000)

REGION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ATLANTIC	284	91	127	163	142	138	162	193	200	243	266	309
GREAT LAKE	173	119	150	148	173	165	189	202	229	240	278	260
MOUNTAIN	710	543	410	390	351	390	417	480	508	535	580	603
SOUTHWEST	160	82	104	78	102	120	143	135	150	165	188	210
PACIFIC	400	250	278	270	295	316	325	400	425	450	503	515
TOTAL	1727	1085	1071	1049	1063	1129	1236	1410	1512	1633	1815	1897

----- FORM SIZE 8.5 INCHES -----

OPTIONAL COMPRESSED PRINT (P600)

* FORECAST BY REGION, ACME GADGET, INC. SALES IN ('000)

REGION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ATLANTIC	284	91	127	163	142	138	162	193	200	243	266	309
GREAT LAKE	173	119	150	148	173	165	189	202	229	240	278	260
MOUNTAIN	710	543	410	390	351	390	417	480	508	535	580	603
SOUTHWEST	160	82	104	78	102	120	143	135	150	165	188	210
PACIFIC	400	250	278	270	295	316	325	400	425	450	503	515
TOTAL	1727	1085	1071	1049	1063	1129	1236	1410	1512	1633	1815	1897

----- FORM SIZE 11.0 INCHES -----

FIGURE 4-3.
COMPRESSED PRINT

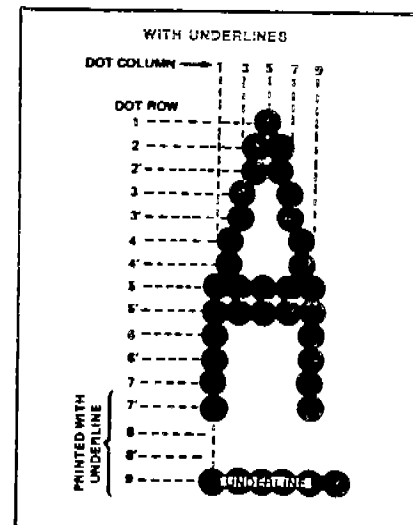
4.0 PROGRAMMING

4.1.4 ELONGATED (DOUBLE HEIGHT) CHARACTERS (08 HEX)

The Elongated character control code (08 hex) specifies double height characters. This control code can be placed anywhere before the line terminator in each line of characters. The printer automatically reselects the Data Processing (default) print after receiving a line terminator code. Therefore it is necessary to place the Elongated character control code in each line printed double height.

Double height characters have the same width (number of vertical dot columns) as the normal characters. The printer formats double height characters by printing each horizontal row twice (except the top and bottom rows). Double height characters are printed at reduced speed.

Double height characters printed at 6 or 8 lpi line spacing result in an actual spacing of 3 lpi and 4 lpi, respectively. Double height characters cannot be intermixed within a line of standard height characters. The Elongated character control code (08 hex) may be reconfigured to 0E hex.



ELONGATED PRINT

* FORECAST BY REGION, ACME GADGET, INC.

SALES IN (000)

REGION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ATLANTIC	284	91	127	163	142	138	162	193	200	243	266	309
GREAT LAKE	173	119	150	148	173	165	189	202	229	240	278	260
MOUNTAIN	710	543	410	390	351	390	417	480	508	535	380	603
SOUTHWEST	160	82	106	78	102	120	143	135	150	165	188	210
PACIFIC	400	250	278	270	295	316	325	400	425	450	503	515
TOTAL	1727	1085	1071	1049	1063	1129	1236	1410	1512	1633	1815	1897

4.0 PROGRAMMING

4.1.5 CARRIAGE RETURN (0D HEX)

The Carriage Return control code (0D hex) returns the line buffer pointer to the beginning of the same line. This allows underlining, adding, changing or deleting of characters.

After all underlining, adding, and deleting have been specified, the host computer sends a line terminator (line feed or form feed only) which prints the contents of the buffer.

If the printer is configured to automatically add a line feed upon receipt of a carriage return control code or buffer full condition, the underline, add, and delete functions are disabled.

4.1.6 LINE FEED (0A HEX)

Line Feed control (0A) hex is a line terminator code causing the contents of the printer buffer to print and advance the paper to the next print line. The function of the Line Feed control code in Plot Mode is described in sections 4.2.4. and 4.2.5.

4.1.7 VERTICAL TAB (0B HEX)

The Vertical Tab control code (0B hex) is a line terminator used when the EVFU is loaded. The Vertical Tab control code causes the printer to slew paper to the line identified by the Channel 12 code. If the EVFU is not loaded, the Vertical Tab control code causes the printer to advance paper one line. EVFU operation is discussed in Section 4.3.

4.1.8 FORM FEED (0C HEX)

The Form Feed control code (0C hex) is a line terminator causing the buffer to print and then advance the paper to the next Top-of-Form. This control code assumes that the Top-of-Form position is set properly.

Top-of-Form position is modified by the EVFU channel code or the Forms Length Selector option. If the Forms Length Selector is not installed, an 11 inch paper length is the default.

4.0 PROGRAMMING

4.1.9 8 LINES PER INCH SPACING (06 HEX)

The 8 lpi control code (06 hex) selects 8 lines per inch (lpi) line spacing.

The 8 lpi control code can be placed anywhere before the line terminator code. This instructs the paper advance mechanism to move a shorter distance (increase the lpi) after receiving a line terminator. When the line terminator code is received the buffer is printed, paper is advanced at 8 lpi, and the original line spacing is reselected (6 lpi unless an alternate is configured). The 8 LPI indicator on the Operator Panel illuminates when 8 lpi spacing is selected by either the switch or the 8 lpi control code. To assign alternate line spacing to the codes or the switch, refer to section 3.2.8.

4.1.10 UNDERLINE (5F HEX)

The Underline control code (5F hex) causes the printer to underline specified characters in the printer line buffer. Line buffer is accessible only after the line with characters to be underlined is terminated by a carriage return code (0D hex). Underline codes are then inserted beneath the characters to be underlined.

Spaces must be inserted at character positions that are not to be underlined. It is not necessary to pad the end of the line with spaces. This is done automatically by the printer after it receives a line terminator (line feed or form feed).

EXAMPLE:

LINE NO.	ENTER	RESULT
1	THE PRINTRONIX PRINTER (CR)	THE PRINTRONIX PRINTER
2	ssss _____ (LF)	THE <u>PRINTRONIX</u> PRINTER

KEY

s = Space (20 hex) _ = Underline (5F hex)
 LF = Line Feed (0A hex) CR = Carriage Return (0D hex)

4.0 PROGRAMMING

4.1.11 SPACE (20 HEX)

The Space control code (20 hex) specifies no printing at the character position it occupies. However, if the previous line was terminated with a carriage return code, each space code creates a "skip" character. The space code does not modify the contents of the printer line buffer.

Use the space code to pad the blank character positions between horizontal tab points. It is not necessary to pad the end of a line of print with space codes. This is done automatically by the printer after it receives a line terminator.

EXAMPLE:

LINE	ENTER	RESULT
1	INVOICE NO. DATE (CR)	INVOICE NO. DATE
2	ssssssssssss3167ssssss5/17/84	INVOICE NO. 3167 DATE 5/17/84

KEY

s = Space (20 hex) CR = Carriage Return (0D hex)

4.1.12 DELETE (7F HEX)

The Delete control code (7F hex) causes the printer to leave a blank space at the corresponding character position. If the previous line was terminated with a Carriage Return control code, the Delete control code is used to delete the corresponding character in the printer line buffer.

As shown below, the four delete control codes remove "DATE" from the printed line.

EXAMPLE:

LINE NO.	ENTER	RESULT
1	INVOICE NO. DATE (CR)	INVOICE NO. DATE
2	ssssssssssss3176(CR)	INVOICE NO. 3176
3	ssssssssssss____dddd(LF)	INVOICE NO. <u>3176</u>

KEY

s = Space (20 hex) CR = Carriage Return (0D hex)
d = Delete (7F hex) LF = Line Feed (0A hex)

4.0 PROGRAMMING

4.1.13 ALTERNATE CHARACTER SET OPTION

The alternate character PROM can be accessed by using one of two methods:

- a. Addressing the PROM with interface DATA LINE 8.
- b. Selecting/deselecting the PROM with Shift Out and Shift In control codes.

A true logic level on interface DATA LINE 8 selects the alternate character PROM and deselects the main character PROM. A false logic level on interface Data Line 8 deselects the alternate character PROM and selects the main character PROM. In either case, interface data lines 1 through 7 specify a character in the selected PROM.

If interface Data Line 8 is not available, Shift Out (OE hex) and Shift In (OF hex) control codes may be used to access the alternate character PROM. The shift out code causes subsequent characters to be selected from the alternate PROM until either a Shift In code or a line terminator code is received. Reception of the Shift In or line terminator code, deselects the alternate PROM and selects the main PROM. If a line is to begin with characters from the optional set, the Shift Out code must precede the first character. The Shift Out control code (OE hex) may be reconfigured to 0B hex.

4.0 PROGRAMMING

4.2 PLOT MODE

The P-Series Plot Mode is a dot-addressable graphics feature standard to all printers. Utilizing the Plot Mode allows the user to create a variety of graphics including: bar graphs, bar codes, pie charts, and complex curves. Since graphics are generated under host computer control any individual dot position may be addressed and printed.

NOTE: The EVFU will not operate in Plot Mode.

4.2.1 DOT FORMAT AND RESOLUTION

Each data line received from the host computer specifies the position of dots printed on a single horizontal dot row. The number of dots printed in each row defines Plot Mode Resolution. Each dot row may be printed at two resolutions.

- **NORMAL RESOLUTION** - Using the odd dot plot control code (05 hex) the six odd-numbered dot columns can be addressed to create vertical resolution of 72 dots per inch and horizontal resolution of 60 dots per inch (792 dots per row maximum).



NORMAL RESOLUTION

- **HIGH RESOLUTION** - Using the even dot plot control code (04 hex) in conjunction with the odd dot plot control code, all twelve dot columns can be addressed to create vertical resolution of 72 dot per inch and horizontal resolution of 120 dots per inch (1584 dots per row maximum).



HIGH RESOLUTION

4.0 PROGRAMMING

4.2.2 PLOT SPEED

Normal plot speed may be doubled when the printer is configured for double speed plot. However, hammer coils may be overheated by printing solid or near solid black areas over an extended range. An overheated coil will usually be indicated by uneven or unprinted dots. When the printer is configured for double speed plot, it is good practice to avoid printing more than 25 percent of the possible dots on a page.

● CAUTION ●

WHEN THE PRINTER IS CONFIGURED FOR DOUBLE SPEED PLOT, PLOTTING AT HAMMER DUTY CYCLES GREATER THAN 25% PER PAGE MAY CAUSE DAMAGE TO THE PRINTER HAMMER MECHANISM AND ELECTRONICS.

4.2.3 PROGRAMMING IN PLOT MODE

A programmed plot data line contains a maximum of 132 data bytes, a plot mode control code, and a line terminator (Figure 4-4). The first data byte of the line specifies the dots to be printed in the first character column. The next data byte specifies the dots to be printed in the next character column.

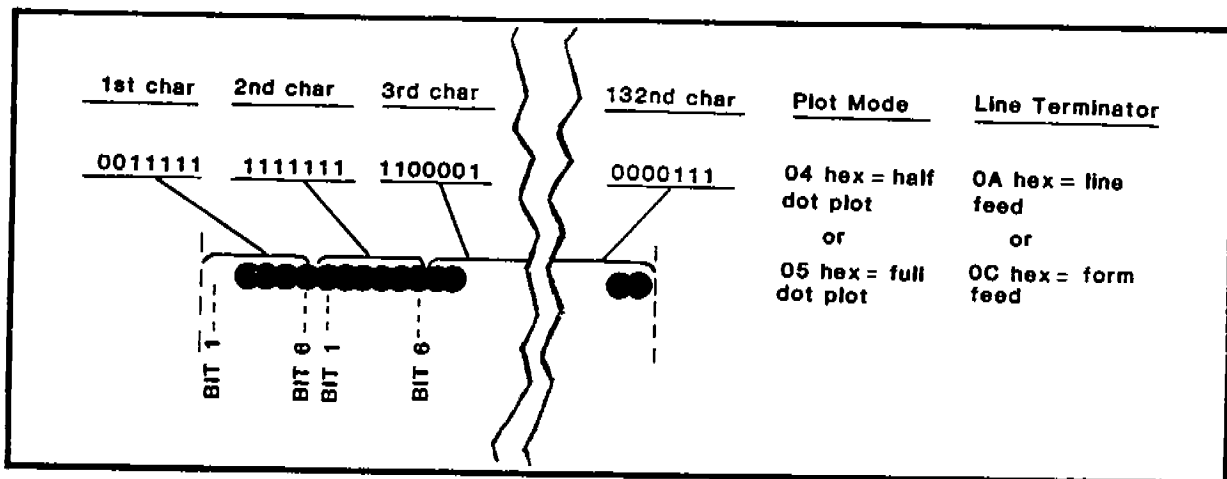


FIGURE 4-4.
PLOT DATA LINE FORMAT

4.0 PROGRAMMING

4.2.3 PROGRAMMING IN PLOT MODE (Continued)

Each data byte specifies 6 of the 12 dot columns of a character column as shown in Figure 4-5. Using Odd dot plot, (05 hex), bits 1 through 6 of a data byte specify the six odd numbered dot columns. In even dot plot, (control code 04 hex) bits 1 through 6 of a data byte specify the six even numbered dot columns. Bits 6 and/or 7 must always be a 1 in plot mode. Bit 8 is not used and may be a 0 or 1.

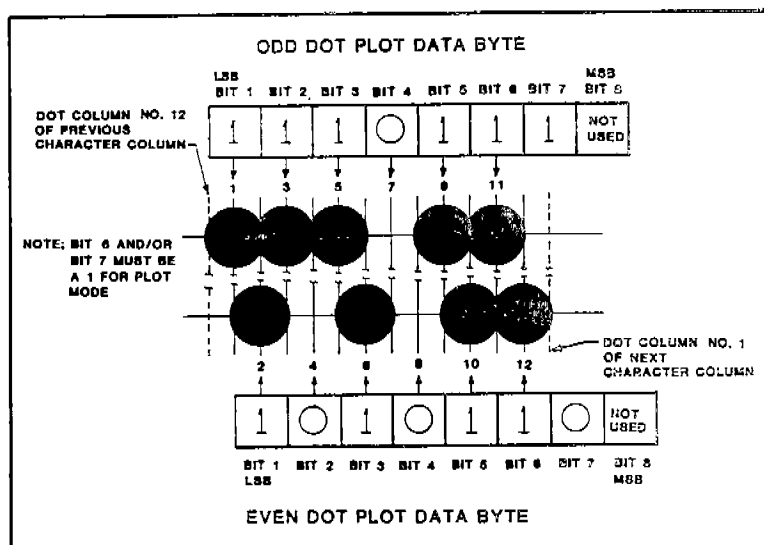


Table 4-3 illustrates dot patterns for corresponding data byte values. The plot mode control code can be inserted anywhere in the data line before the line terminator. The line terminator is either a line feed (0A hex) or form feed (0C hex) control code. Do not terminate a row of plot data with an EVFU command.

4.0 PROGRAMMING

4.2.3 PROGRAMMING IN PLOT MODE (Continued)

TABLE 4-3.
DATA BYTE DOT PATTERNS

Binary	Oct	Dec	Hex	ASCII	2 4 6 8 10 12 1 3 5 7 9 11	Binary	Oct	Dec	Hex	ASCII	2 4 6 8 10 12 1 3 5 7 9 11	Binary	Oct	Dec	Hex	ASCII	2 4 6 8 10 12 1 3 5 7 9 11
01000000	040	32	20	Space		10000000	100	64	40	@		11000000	140	96	60		
01000001	041	33	21	!		10000001	07	65	41	A		11000001	141	97	61	a	
01000010	042	34	22	"		10000010	102	66	42	B		11000010	142	98	62	b	
01000011	043	35	23	#		10000011	103	67	43	C		11000011	143	99	63	c	
01001000	044	36	24	\$		10001000	104	68	44	D		11001000	144	100	64	d	
01001001	045	37	25	%		10001001	105	69	45	E		11001001	145	101	65	e	
01001010	046	38	26	&		10001010	106	70	46	F		11001010	146	102	66	f	
01001011	047	39	27	'		10001011	107	71	47	G		11001011	147	103	67	g	
01010000	050	40	28	(		10010000	110	72	48	H		11010000	150	104	68	h	
01010001	051	41	29	)		10010001	111	73	49	I		11010001	151	105	69	i	
01010010	052	42	2A	*		10010010	112	74	4A	J		11010010	152	106	6A	j	
01010011	053	43	2B	+		10010011	113	75	4B	K		11010011	153	107	6B	k	
01011000	054	44	2C	,		10011000	114	76	4C	L		11011000	154	108	6C	l	
01011001	055	45	2D	-		10011001	115	77	4D	M		11011001	155	109	6D	m	
01011010	056	46	2E	.		10011010	116	78	4E	N		11011010	156	110	6E	n	
01011011	057	47	2F	/		10011011	117	79	4F	O		11011011	157	111	6F	o	
01100000	060	48	30	0		10100000	120	80	50	P		11100000	160	112	70	p	
01100001	061	49	31	1		10100001	121	81	51	Q		11100001	161	113	71	q	
01100010	062	50	32	2		10100010	122	82	52	R		11100010	162	114	72	r	
01100011	063	51	33	3		10100011	123	83	53	S		11100011	163	115	73	s	
01101000	064	52	34	4		10101000	124	84	54	T		11101000	164	116	74	t	
01101001	065	53	35	5		10101001	125	85	55	U		11101001	165	117	75	u	
01101010	066	54	36	6		10101010	126	86	56	V		11101010	166	118	76	v	
01101011	067	55	37	7		10101011	127	87	57	W		11101011	167	119	77	w	
01110000	070	56	38	8		10110000	130	88	58	X		11110000	170	120	78	x	
01110001	071	57	39	9		10110001	131	89	59	Y		11110001	171	121	79	y	
01110010	072	58	3A	:		10110010	132	90	5A	Z		11110010	172	122	7A	z	
01110011	073	59	3B	;		10110011	133	91	5B	[		11110011	173	123	7B	{	
01111000	074	60	3C	<		10111000	134	92	5C	\		11111000	174	124	7C	~	
01111001	075	61	3D	=		10111001	135	93	5D	]		11111001	175	125	7D	}	
01111010	076	62	3E	>		10111010	136	94	5E	^		11111010	176	126	7E	~	
01111011	077	63	3F	?		10111011	137	95	5F	_		11111011	177	127	7F	Delete	

NOTE: Odd Dot Plot prints pattern at odd numbered dot positions (1,3,5,7,9,11).
Even Dot Plot prints pattern at even numbered dot positions (2,4,6,8,10,12).

4.0 PROGRAMMING

4.2.4 ODD DOT PLOT (05 HEX)

The odd dot plot (05 hex) control code enables dot printing at odd numbered dot columns (normal resolution) (see Figure 4-6).

For example.....

to print a four inch wide, normal resolution line, the program should send the following:

1. The Odd dot plot control code (05 hex),
2. 40 data bytes (10 characters per inch) of
"?" characters (? = 3F hex = 0011 1111 binary),
3. Line feed (0A hex).

The odd dot plot control code can be placed anywhere in the data line before the line terminator.

In program lines specifying odd dot plot, the line feed control code has a unique function as follows:

Line Feed (0A hex) - Causes the printer to plot the contents of the print buffer and move paper to the next dot row. This occurs even when the printer buffer is empty.

4.0 PROGRAMMING**4.2.5 EVEN DOT PLOT (04 HEX)**

The even dot plot (04 hex) control code selects dot printing at even numbered dot columns (see Figure 4-6). Even dot plot is normally used in conjunction with odd dot plot to produce high resolution graphics. Use odd dot plot for normal resolution graphics.

For example.....

to print a four inch horizontal high resolution line, the program should send the following:

1. Even dot plot control code (04 hex).
2. 40 data bytes (10 characters per inch) of "?" characters (?=3F hex = 0011 1111 binary).
3. Line feed (0A hex) control code.

At this point the hammerbank is ready to make a second pass across the same dot row. The next data string should send the following:

4. Odd dot plot control code (05 hex)
5. 40 data bytes of "?" characters.
6. Line feed (0A hex).

The first string loads the buffer and prints the even dots without advancing the paper. The second data string loads the buffer, prints the odd dots, and then advances the paper. The even or odd dot plot control code can be placed anywhere in the data line before the line terminator.

When data string lines specify Even dot plot, the line feed control code has a unique function as follows:

Line Feed (0A hex) - Causes the printer to plot the contents of the print buffer, however, paper is not advanced. A line feed does not advance paper even when the buffer is empty.

4.0 PROGRAMMING

4.2.6 COMBINING GRAPHICS AND CHARACTERS

P-Series printers are capable of printing graphics and characters (text) on the same page in two ways: Plot Mode Text and Print Mode/Plot Mode.

● PLOT MODE TEXT

By sending dot addressed data in the appropriate patterns any character or symbol can be generated. In this method, both graphics and text may be printed on the same line.

● PRINT MODE/PLOT MODE

Text and graphics may be printed on the same page but not on the same line. In this method, characters are generated from printer memory and graphics are programmed at the host computer. Using Character Print Mode/Plot Mode to generate text and graphics will be significantly faster than Plot Mode Text. It may be helpful to combine text and graphics by printing two passes. This requires the entire page of text to be printed on the first pass, followed by graphics printed on a second pass. Remember that a Plot Mode control code must be entered with each string of graphics data or the printer will default to Character Print Mode.

When returning to Character Print Mode from Plot Mode, an extra line feed code must be included in the last data string. This will maintain line registration throughout the page. If this extra line feed is omitted, the first line of characters may be truncated, as shown in Figure 4-7.

NOTE: The B7 and B9 Logic boards may be configured to eliminate the necessity of an extra line feed.

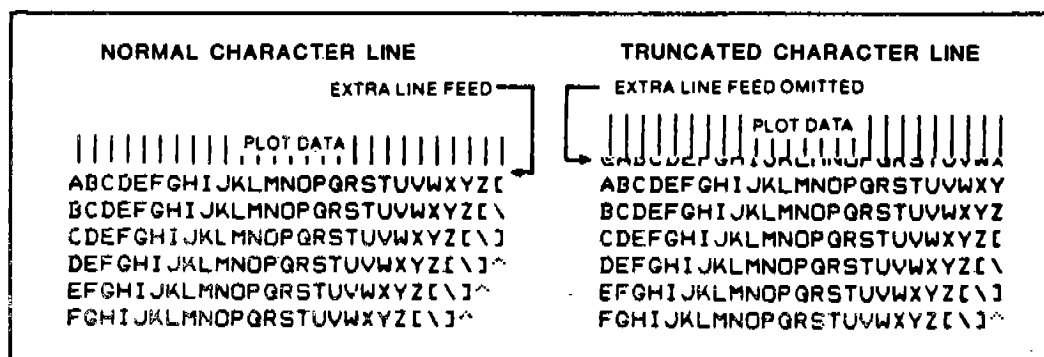


FIGURE 4-6.
TRUNCATED CHARACTER LINE

4.0 PROGRAMMING

4.3 ELECTRONIC VERTICAL FORMAT UNIT (EVFU)

The EVFU, Electronic Vertical Format Unit, is a standard feature of all P-Series printers. The EVFU allows the operator to preset lines to be printed on forms and documents used often. This is valuable when performing merge operations such as invoicing and payrolling. By flagging each line to be printed, the EVFU will automatically slew (advance the paper) to the next line and print the appropriate data record. Any form or document of up to 132 lines (two 11-inch sheets of paper) may be flagged. The EVFU provides 13 channels (flags) to identify lines to be printed. A Vertical Tab Command rapidly advances paper. Two control commands, Start Load and End Load, enable the EVFU program.

The EVFU is first loaded with a form (document) definition program. This program assigns channel codes to specific lines to be printed. Later, the host computer operating program sends these channel codes which command the printer to advance to the corresponding print line.

4.3.1 EVFU OPERATING PROGRAM

The EVFU Operating program is written by the user to access the control codes assigned in the form definition program. After the operating program is running, subsequent forms printing is under host computer control.

4.3.2 GENERAL EVFU PROGRAMMING INFORMATION

- **INTELLIGENT GRAPHICS PROCESSOR (IGP)** - The EVFU will not operate as described in this section when the IGP is installed. Refer to the IGP-10 User's Reference Manual for the appropriate operating parameters.
- **LINE SPACING** - The printer may be set for line spacing of either 6 lpi or 8 lpi when using the EVFU. Line spacing determines form length and should not be changed within a form. The EVFU is not compatible with 10 lpi spacing.
- **SKIP OVER PERFORATION** - Loading the EVFU form definition program automatically disables the skip over perforation feature.
- **ELONGATED CHARACTERS** - Elongated characters may be used in EVFU programs. The EVFU automatically counts a line of Elongated characters as two lines.

4.0 PROGRAMMING**4.3.2 GENERAL EVFU PROGRAMING INFORMATION**

- **DEFAULT OPERATION** - If an EVFU form definition program is not loaded (Top-Of-Form indicator is extinguished), the printer responds to EVFU control codes sent by the host computer as line feeds.

Channel Codes = 1 line feed

Vertical Tab = 1 line feed

- **RUNAWAY PROTECTION** - If the host computer sends a Channel code that was not assigned by the EVFU form definition program, paper will slew 132 lines and stop.

4.0 PROGRAMMING

4.3.3 EVFU CONTROL AND CHANNEL CODES

EVFU Control and Channel codes in hex, decimal, and octal are listed in Tables 4-4 and 4-5. Note that there are two codes for each EVFU function. The correct code is dependent upon the interface used. Interfaces using a paper instruction line (PI line) such as the Dataproducts and RS-232 interfaces will use different codes than Centronics compatible interface. With Interfaces not using a PI line (Centronics), the W5 jumper on the Logic A PCBA must be installed.

NOTE: If the W5 jumper is not installed when needed, paper runaway will occur.

EVFU Control and Channel functions are described as follows:

- **START LOAD** - This control code clears and initializes the EVFU for reception of the form definition program. The start load control code is 1E hex (PI not used) or 6E hex (PI used).
- **END LOAD** - This control code terminates loading of the form definition program and the Operator Panel TOP-OF-FORM indicator illuminates. The End Load control code value is 1F hex (PI not used) or 6F hex (PI used).
- **CHANNEL 1** - Typically used in the EVFU form definition program to assign the location of the first line of the form (Top-of-Form). The operating program sends the Top-of-Form control code (or Channel 1 code) to advance to the first line of the next form.
- **CHANNELS 2 through 11, 13 and 14** - General use Channel codes are used to flag lines to be printed within a form. A Channel code can be assigned to any line. When the operating program sends a general use Channel code, the printer will advance paper to the corresponding line assigned to that channel.
- **CHANNEL 12** - Reserved as a vertical tab. This code is used to rapidly advance the paper to the next part of the form assigned a channel 12 code.
- **FORM FEED (0A hex)** - Sent by the operating program to slew paper to the print line assigned a Channel 1 code. If Channel 1 was not assigned by the EVFU form definition program or the EVFU is not loaded, the Form Feed control code causes paper to advance to the next default Top-of-Form line.

4.0 PROGRAMMING

4.3.3 EVFU CONTROL AND CHANNEL CODES (Continued)

TABLE 4-4.
EVFU CONTROL AND LINE ID CODES
WITH PI SIGNAL
(DATAPRODUCTS, RS-232 INTERFACES)

FUNCTION	EVFU CHANNEL	HEX	DECIMAL	OCTAL	ASCII	PI SIGNAL LEVEL
Top-of-Form	1	00	0	000	^@	1
General Use	2	01	1	002	^A	1
General Use	3	02	2	002	^B	1
General Use	4	03	3	003	^C	1
General Use	5	04	4	004	^D	1
General Use	6	05	5	005	^E	1
General Use	7	06	6	006	^F	1
General Use	8	07	7	007	^G	1
General Use	9	08	8	010	^H	1
General Use	10	09	9	011	^I	1
General Use	11	0A	10	012	^J	1
Vertical Tab	12	0B	11	013	^K	1
General Use	13	0C	12	014	^L	1
General Use	14	0D	13	015	^M	1
Start Load	--	6E	110	156		1
End Load	--	6F	111	157		1

TABLE 4-5.
EVFU CONTROL CODES WITHOUT PI SIGNALS
(CENTRONICS INTERFACES)

FUNCTION	EVFU CHANNEL	HEX	DECIMAL	OCTAL	ASCII
Top-of-Form	1	10	16	020	^P
General Use	2	11	17	021	^Q
General Use	3	12	18	022	^R
General Use	4	13	19	023	^S
General Use	5	14	20	024	^T
General Use	6	15	21	025	^U
General Use	7	16	22	026	^V
General Use	8	17	23	027	^W
General Use	9	18	24	030	^X
General Use	10	19	25	031	^Y
General Use	11	1A	26	032	^Z
Vertical Tab	12	1B	27	033	^[
General Use	13	1C	28	034	^\ ^_
General Use	14	1D	29	035	^]
Start Load	--	1E	30	036	
End Load	--	1F	31	037	

4.0 PROGRAMMING

4.3.4 FORM LINE SPACING

The total number of print lines within a specific form or document must be determined before loading the EVFU.

A typical payroll check illustrating form line spacing is shown in Figure 4-7.

For example.....

If the printer is set for 6 lpi spacing, a 4 inch-high paycheck will be 24 lines high (4x6=24). With spacing of eight lines per inch (8 lpi), the paycheck is 32 lines high (4x8=32).

Consequently, an EVFU form definition program must assign line-identifying codes for either 24 lines or 32 lines.

The following examples are for 6 lpi (24 lines).

In this example, the DATE is printed on line 6, the NAME on line 9, and the amount on line 16.

		LINE
		1 TOF
		2
	XXX XXX XXX XXX	3
		4
		5
	MARCH 27, 1984	6
		7
	JOHN E. DOE	8
		9
		10
		11
		12
		13
		14
4"	ONE HUNDRED*****.00 100.00	15
		16
		17
		18
		19
		20
		21
		22
		23
		24 TOF

FIGURE 4-7.
TYPICAL FORM LINESPACING

4.0 PROGRAMMING

4.3.5 EVFU FORM DEFINITION PROGRAM

The EVFU form definition program is sent to the printer by the host computer. The form definition program assigns Channel codes to lines to be printed. These codes are later accessed by the operating program. A sample form definition program is shown in Figure 4-8. The sample illustrates from left to right: Form Heading, Line Number, EVFU Load Program, Hex Code and Definition.

EVFU form definition is loaded as follows.

1. Start Load control code.
2. Channel 1 control code to assign the Top-of-Form.
3. A series of Channel codes, one for each line of the form. If the form is 25 lines long, 25 channel codes will be entered. Each line to be printed is assigned a unique Channel code. Lines that are not printed are assigned a filler channel code. The filler code functions as a line feed and can be any channel code not used for a unique assignment. Typically, a single filler code is used throughout a form or document.
4. End Load control code.

An operating program which references these specified Channels, controls subsequent EVFU operation.

The EVFU form definition program is cleared from the EVFU memory by either of the following methods:

- ◊ Sending the Start Load control code only.
- ◊ Setting the printer power switch OFF, then ON.

4.0 PROGRAMMING

4.3.5 EVFU FORM DEFINITION PROGRAM (Continued)

In the following example the Top-of-Form is illustrated as being the first line of the form. It is important to note that the TOF may also be set as the first line to be printed. For example, line 3 could be assigned the Top-of-Form channel 1.

In this case a Form Feed, pushing TOF button, or sending a CH1 code will slew paper to line 3.

To avoid confusion, it is best to assign unique channel codes to each line to be printed. If, however, a particularly long or complex form is loaded, a channel code may define more than one line. In the Figure 4-8 example, both line 3 and line 5 could have been assigned the channel 3 code. When the host computer sends the channel 3 code the first time, EVFU forwards the paper to line 3 and prints the NAME data. The second time the host computer sends the channel 3 code the EVFU forwards the paper to the next occurrence of channel 3. In this case, line 5. The operating program now sends the AGE data to be printed.

4.0 PROGRAMMING

4.3.5 THE EVFU FORM DEFINITION PROGRAM (Continued)

FIGURE 4-8.
EVFU FORM DEFINITION LOAD PROGRAM

FORM HEADING	LINE NUMBER	EVFU LOAD PROGRAM	HEX CODE CENTRONICS INTERFACE NO PI LINE
		START LOAD	1E
	1	CH1	10
	2	CH2	11
NAME <u>JOE JACOB DOE</u>	3	CH3	12
	4	CH2	11
AGE <u>45</u>	5	CH4	13
	6	CH2	11
	7	CH2	11
DEPARTMENT <u>ACCOUNTING</u>	8	CH5	14
	9	CH6	15
	10	CH2	11
	11	CH2	11
	12	CH2	11
ADDRESS <u>17 CARTWRIGHT, IRVINE CA</u>	13	CH14	1D
	14	CH2	11
	15	CH2	11
NUMBER <u>1759386</u>	16	CH9	18
	17	CH2	11
	18	CH2	11
DATE <u>02/06/84</u>	19	CH12	13
	20	CH2	11
		END LOAD	1F

4.0 PROGRAMMING

4.3.5 THE EVFU FORM DEFINITION PROGRAM (Continued)

EVFU
LOAD
PROGRAM

DEFINITION

START LOAD	Resets EVFU - Forms length defaults to current setting of FL; enables EVFU loading.
CH1	The 1st line of a form is typically assigned CH1. CH1 is interpreted as Top-of-Form and is normally used once per form. A Form Feed (0A hex), pushing TOP button, or CH1 will slew paper to this line.
CH2	Any EVFU channel can be a "filler." Channel 2 will be used to fill all lines not assigned unique channel codes.
CH3	Channel 3 defines line 3 to be printed with NAME data.
CH2	Channel 2 defines line 4 as filler.
CH4	Channel 4 defines line 5 to be printed with AGE data.
CH2	Filler, line 6.
CH2	Filler, line 7.
CH5	Channel 5 defines line 8 to be printed with DEPARTMENT data.
CH6	Channel 6 defines line 9 to be printed with TITLE data.
CH2	Filler, line 10.
CH2	Filler, line 11.
CH2	Filler, line 12.
CH14	Channel 14 defines line 13 to be printed with ADDRESS data. Channel number do not have to be used sequentially.
CH2	Filler, line 14.
CH2	Filler, line 15.
CH9	Defines line 16 to be printed with NUMBER data.
CH2	Filler, line 17.
CH2	Filler, line 18.
CH12	Defines line 19 to be printed with DATE data.
CH2	Filler, line 20.
END LOAD	End load defines the end of the EVFU load program. End Load illuminates the TOP pushbutton indicating EVFU is loaded. TOP is now under EVFU control.

4.0 PROGRAMMING

4.4 SLEW RELATIVE PROGRAMMING

Slew Relative is a paper advance technique that performs EVFU tasks without a form definition program. This technique requires the host computer to set the paper instruction (PI) line true (Logic 1) and output a binary code on the Data Lines. This code specifies the number of lines the paper is slewed (advanced) after a line is printed.

Any number from 1 to 16 lines may be slewed with a single command. Table 4-6 lists these codes and the corresponding number of lines slewed. Note that the code varies depending on the binary count system configured by the Logic B PCBA, jumper W12. For configuration details refer to Section 3.2.11.

TABLE 4-6.
EVFU SLEW RELATIVE CODES

NUMBER LINES SLEWED* W12 JUMPER IN OUT		HEX	DECIMAL	OCTAL	PI LINE LEVEL
1	1	10	16	20	1
2	1	11	17	21	1
3	2	12	18	22	1
4	3	13	19	23	1
5	4	14	20	24	1
6	5	15	21	25	1
7	6	16	22	26	1
8	7	17	23	27	1
9	8	18	24	30	1
10	9	19	25	31	1
11	10	1A	26	32	1
12	11	1B	27	33	1
13	12	1C	28	34	1
14	13	1D	29	35	1
15	14	1E	30	36	1
16	15	1F	31	37	1

* This column is dependent on the W12 Jumper configuration on the Logic B PCBA.

NOTE: The Slew Relative technique is not available to printers with the Centronics interface.

4.0 PROGRAMMING

4.4 SLEW RELATIVE PROGRAMMING (Continued)

Figure 4-9 below illustrates the Slew Relative technique and corresponding hex codes.

FIGURE 4-9.
SAMPLE FORM USING SLEW RELATIVE TECHNIQUE

FORM HEADING	LINE NUMBER	MOVE 1 LINE=0000 HEX CODE	MOVE 1 LINE=0001 HEX CODE	PI LINE	COMMENTS
NAME _____	1	11	12	1	2 line slew
	2				
AGE _____	3	12	13	1	3 line slew
	4				
	5				
DEPARTMENT _____	6	13	14	1	4 line slew
	7				
	8				
	9				
TITLE _____	10	14	15	1	5 line slew
	11				
	12				
	13				
	14				
ADDRESS _____	15				
	16				
NUMBER _____	17	12	13	1	3 line slew
	18				
	19				
DATE _____	20	11	12	1	2 line slew
	21				(to next form)
NAME _____	1				

CORRECTIVE MAINTENANCE

CONTENTS

Test Pattern Printing	5.1
Corrective Maintenance Flow Chart	5.2

FIGURES

Corrective Maintenance Flow Chart	5-1
-----------------------------------	-----



5.0 CORRECTIVE MAINTENANCE

Information in this section will assist in determining simple malfunctions that can be corrected by an operator.

A corrective maintenance flow chart is provided in Figures 5-1, and 5-2. This will assist in isolating and correcting simple malfunctions.

Failure of the printer to operate in accordance with the designed parameters may be the result of incorrect PCBA configuration. Refer to Section 3.0 for applicable information and procedures.

If the procedures included in this section do not correct the malfunction, refer to the Maintenance Manual or call a Printronix service representative.

● WARNING ●

DISCONNECT THE AC POWER CORD BEFORE ATTEMPTING
TO REPLACE FUSES OR RESET CIRCUIT BREAKERS.
ONLY QUALIFIED PERSONNEL SHOULD ATTEMPT CORRECTIVE
MAINTENANCE BEYOND THE SCOPE OF THIS SECTION.

5.0 CONNECTIVE MAINTENANCE

5.1 TEST PATTERN PRINTING

The test pattern function provides an efficient method of testing the printer mechanics and character print mode electronics. The test pattern is available on P-Series printers with Logic PCBAs A2 and B5 or higher.

◊ The procedure to initiate the test pattern is described below.

1. Set the printer online. (Operator Panel ON LINE indicator is illuminated).
2. Simultaneously press and hold both the CHECK and PAPER ADVANCE switches on the Operator Panel. Lines of 132 characters of the uppercase letter "E" will print.
3. Release the CHECK and PAPER ADVANCE switches to end the test and stop printing.

If the above test fails to produce any result, proceed to the next paragraph. If the test produces abnormal print, refer to the maintenance manual or call a Printronix service representative for additional corrective action. Test pattern interrupts the normal host computer to printer data path. Do not attempt to send data to the printer while running the test pattern.

5.2 CORRECTIVE MAINTENANCE FLOW CHART

The corrective maintenance flow chart in Figures 5-1 and 5-2 provides a series of easily verified operations checks. If a fuse has failed, follow the procedures for accessing the PCBA Card Cage in Section 3.2. The power supply fuses and circuit breakers are located behind the Card Cage on the power supply circuit board. Replacement fuses must have ratings equivalent to the originals.

5.0 CORRECTIVE MAINTENANCE

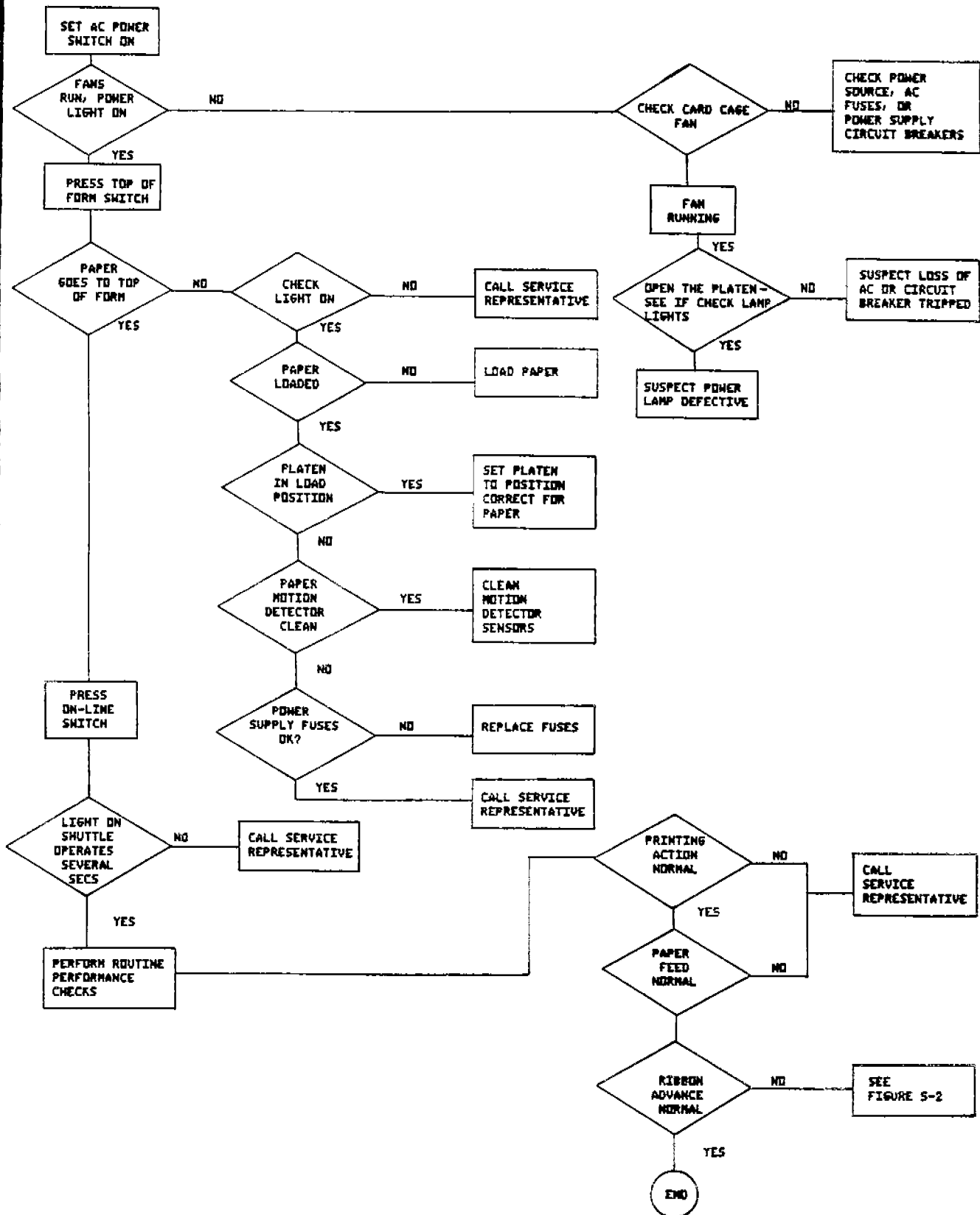


FIGURE 5-1.
CORRECTIVE MAINTENANCE FLOW CHART

5.0 CORRECTIVE MAINTENANCE

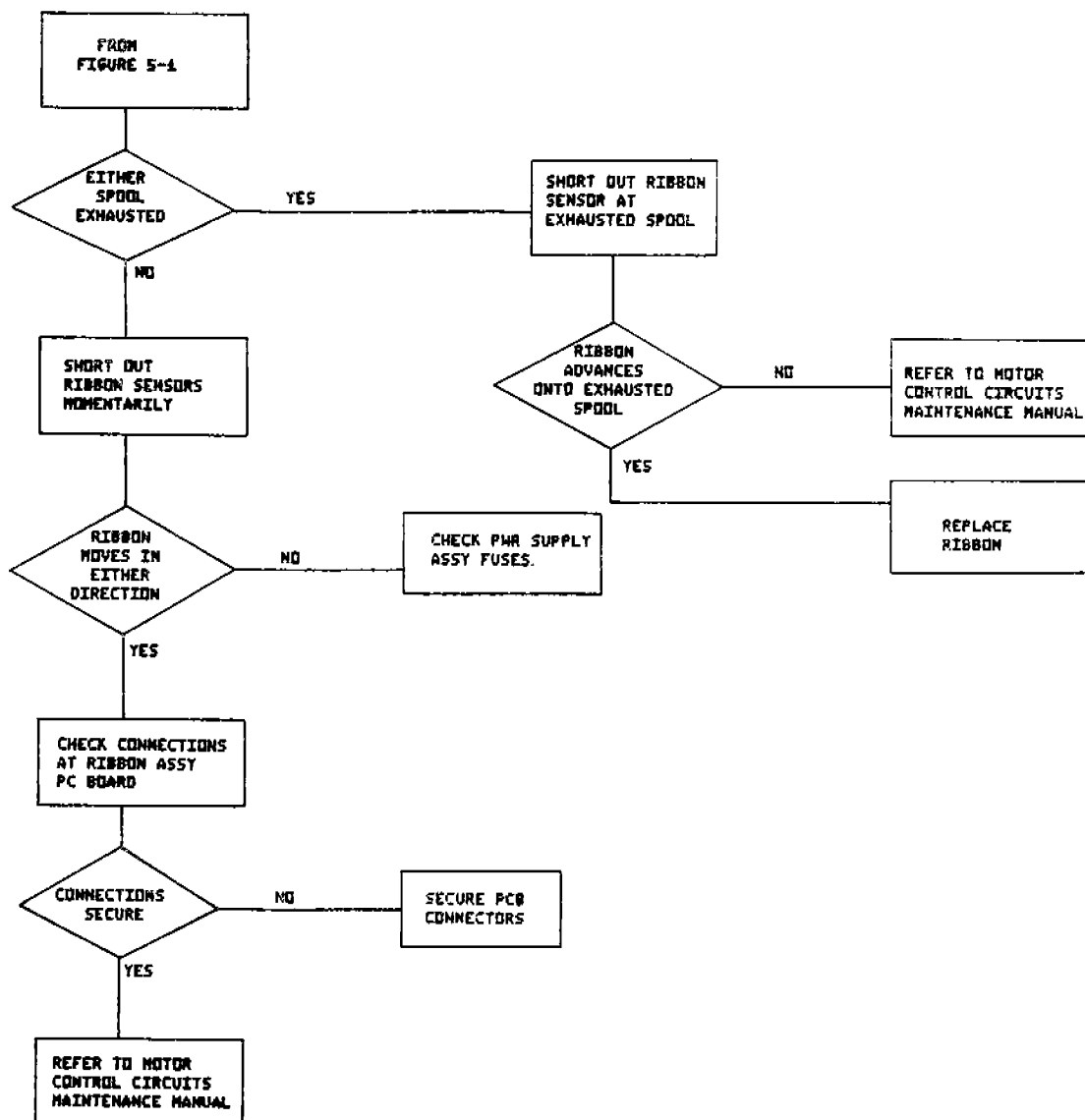


FIGURE 5-1
CORRECTIVE MAINTENANCE FLOW CHART

PRINTER INTERFACE

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6.0 PRINTER INTERFACE

This section provides information on the two standard P-Series printer interfaces; Centronics compatible and Dataproducts compatible.

Description, operation, and configuration information for the optional RS-232 interface board is provided in a Printronix Application Note: RS-232 INTERFACE OPTION, P/N 015564.

Jumpers installed/omitted on the printer's Logic A PCBA configure the interface circuitry for either Centronics or Dataproducts compatibility. Refer to Section 3.0 for configuration details.

The following paragraphs provide information on the Centronics and Dataproducts interface configurations. Table 6-1 lists basic interface characteristics.

**TABLE 6-1.
INTERFACE CHARACTERISTICS**

PARAMETER	CHARACTERISTIC
LOGIC LEVELS	False (low) 0.0V to 0.8V. True (high) 2.0V to 5.5V. Configurable, all signals high or low true with the exception of the Centronics Data Strobe. The leading edge of any data strobe may be independently configurable.
DRIVER	TTL 7406 or equivalent.
Terminating Resistor	1000 ohm pullup to +5.0 volts.
RECEIVER	TTL 7414 or equivalent Resistors
Terminating Resistor	1000 ohm socket mounted DIP pullup to +5V (standard). 220 ohm pullup/330 ohm pulldown (configurable).

6.0 PRINTER INTERFACE

6.1 INTERFACE TERMINATING RESISTORS

P-Series printers are normally shipped with 1K ohm pullup resistors on interface driver output and receiver input lines. (See Figure 6-1.)

Receiver pullup terminating resistor (except the DATA STROBE receiver) are a socket mounted dual inline package (DIP). A socket is also provided for a receiver pulldown DIP. If a long interface cable is used or host computer interface driver requirements specify, the 1K pullup DIP may be replaced with a 220 ohm DIP and a 330 ohm pulldown DIP can be added. Printronix recommends that the 220 ohm pullup be used in conjunction with the 330 ohm pulldown.

The printer shipping kit includes a 220 ohm and a 330 ohm DIP. The DATA STROBE signal receiver has a fixed 470 ohm pullup resistor. For terminating resistor locations, refer to PCBA illustrations Figures 3-3 through 3-7 in Section 3.0.

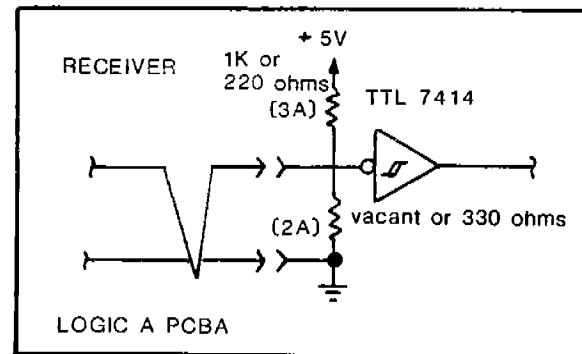
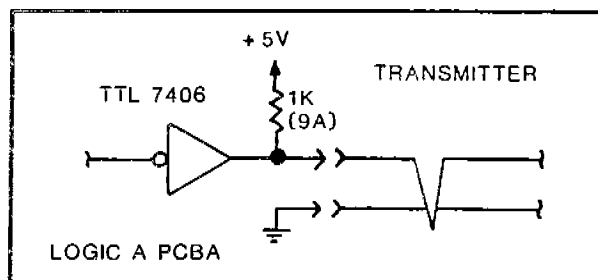


FIGURE 6-1.
INTERFACE LINE DRIVER AND RECEIVER CIRCUIT

6.0 PRINTER INTERFACE

6.2 INTERFACE CABLE REQUIREMENTS

Table 6-2 specifies cable length restrictions for standard and optional interfaces. The interface cable is not supplied by Printronix. For reliable operation, use a shielded interface cable that is connected to the chassis ground at both the printer and the data source.

TABLE 6-2.
INTERFACE CABLE LENGTHS

INTERFACE	MAXIMUM CABLE LENGTH
Centronics compatible	40 feet
Dataproducts compatible	40 feet
Dataproducts Long Lines (optional)	500 feet
RS-232 (optional)	500 feet
RS-232 Current Loop (optional)	1000 feet

6.0 PRINTER INTERFACE

6.3 CENTRONICS COMPATIBLE INTERFACE

The Centronics compatible interface configuration operates with a host computer controller designed for a buffered Centronics Model 703 printer with data transfer rates of up to 200,000 characters per second. The printer-host computer exchange of data operates as follows:

- a. The data source places data on DATA LINE 1 through 7 or 8.
- b. The data source waits at least 50 nanoseconds, then outputs DATA STROBE for at least 100 nanoseconds to load data into the printer buffer.
- c. The printer responds with a 4 microsecond acknowledge (ACKNLG) pulse. The printer also outputs BUSY if a line terminator code (line feed, form feed, EVFU instruction, or vertical tab) was received.
- d. The next data transfer may occur after ACKNLG and BUSY are false.

The interface is disabled if paper error (PE) is true or SLCT is false (printer is offline).

P-Series printers that are factory configured for Centronics interface compatibility contain a 36 pin female connector (Amphenol part number 57-40360 or equivalent) as shown in Figure 6-3.

Centronics interface signal logic levels may be configured high or low true.

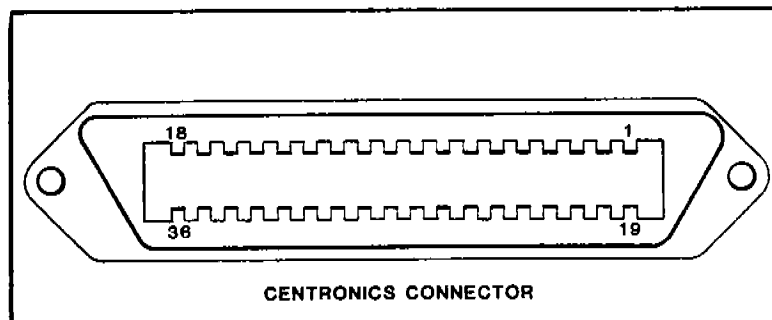


FIGURE 6-2.
CENTRONICS INTERFACE CONNECTOR PIN IDENTIFICATION

6.0 PRINTER INTERFACE

6.3 CENTRONICS COMPATIBLE INTERFACE (Continued)

Table 6-4 lists the Centronics interface signals pin assignment on the printer connector.

TABLE 6-3.
CENTRONICS INTERFACE SIGNALS AND PIN ASSIGNMENTS

INPUT SIGNALS

INPUT SIGNALS	DESCRIPTION	CONNECTOR PIN	
		SIGNAL	RETURN
DATA STROBE	A low active true pulse (at least 100 nS duration) from the host computer to clock data into the printer. Data lines must stabilize for at least 50 nS before DATA STROBE is sent.	1	19
DATA LINE 1	Eight high active lines from the host computer that form a character byte or a Control Code byte. Data Line 8 may be configured to select either the main or alternate character PROM.	2	20
DATA LINE 2		3	21
DATA LINE 3		4	22
DATA LINE 4		5	23
DATA LINE 5		6	24
DATA LINE 6		7	25
DATA LINE 7		8	26
DATA LINE 8		9	27
PAPER INSTRUCTION (PI)	Enables EVFU control (when clocked into printer DATA STROBE). DATA STROBE timing is the same as for data lines.	15	14

NOTE: Interface signal logic levels may be configured high or low true.

6.0 PRINTER INTERFACE

6.3 CENTRONICS COMPATIBLE INTERFACE (Continued)

TABLE 6-3. (Continued)
CENTRONICS INTERFACE SIGNALS AND PIN ASSIGNMENTS

OUTPUT SIGNALS

OUTPUT SIGNALS	DESCRIPTION	CONNECTOR PIN	
		SIGNAL	RETURN
ACKNLG (demand)	Low active pulse from the printer to indicate that the printer is ready for the next data transfer.	10	28
SLCT (ONLINE)	A high active level from the printer to indicate that the printer is ready to receive data. SLCT automatically goes false when CHECK condition exists (PE false).	13 32	N/A
PE (Paper Error)	A high active level from the printer to indicate a CHECK condition.	12 32	16
BUSY	A high active level from the printer to indicate that the printer cannot receive data.	11	29
+5 VOLT TEST	Supplies +5V (1 amp maximum) output for powering a Printronix Test Exerciser.	18	N/A
CHASSIS GROUND	Connections for cable shield.	17	N/A
SPARE	Not used.	30 31 34 35 36	N/A

6.0 PRINTER INTERFACE

6.4 DATAPRODUCTS COMPATIBLE INTERFACE

The Dataproducts compatible interface configuration operates with a host computer designed for the Dataproducts P300 or P600 printer. Data transfer rates of up to 500,000 characters per second are possible. The printer-host computer exchange of data operates as follows:

- a. The printer outputs DATA REQUEST (true) when it is ready to receive data.
- b. The data source places data on DATA LINES 1-8.
- c. The data source outputs DATA STROBE at least 50 nanoseconds after DATA LINE 1-8 are stable to load data into the printer buffer.
- d. The printer drops DATA REQUEST (false) 100 nanoseconds (maximum) after the leading edge of DATA STROBE.
- e. The next data transfer may occur when the printer raises DATA REQUEST which occurs at least 2 microseconds after the trailing edge of DATA STROBE.

Note that data transfer is disabled if READY or ONLINE are false.

P-Series printers that are factory configured for Dataproducts interface compatibility contain a 50 pin female connector (Amphenol part number 205740-1) as shown in Figure 6-4. Table 6-4 lists the Dataproducts interface signals and the pin assignments on the printer connector.

The Dataproducts Interface logic levels can be configured as high or low true.

The Dataproducts Long Lines option consists of a special circuit board/cable assembly located inside the printer.

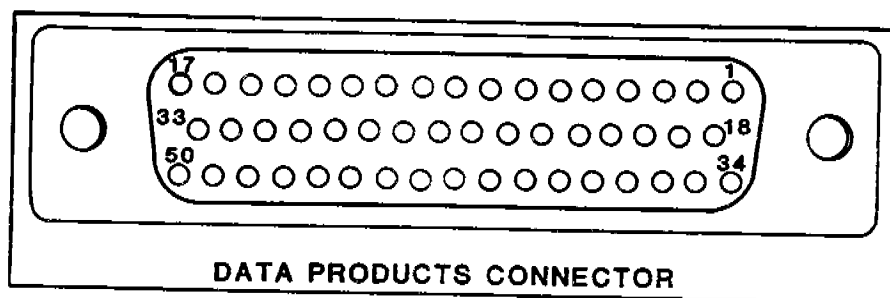


FIGURE 6-3.
DATAPRODUCTS PIN IDENTIFICATION

6.0 PRINTER INTERFACE

6.4 DATAPRODUCTS COMPATIBLE INTERFACE (Continued)

TABLE 6-4.
DATAPRODUCTS INTERFACE SIGNALS AND PIN ASSIGNMENTS

INPUT SIGNALS

INPUT SIGNALS	DESCRIPTION	AMPHENOL CONNECTOR PINS	
		SIGNAL	RETURN
DATA STROBE	A high active pulse (requires Configuration Option 62.1) of at least 100 nS duration sent by host computer to indicate that data is ready to be sent to the printer. DATA STROBE remains high until the DATA REQUEST line goes false.	38	37
PAPER INSTRUCTION (PI)	A high active level from the host computer to control EVFU operation. Clocked into the printer with the same timing as the data lines.	30	14
DATA LINE 1	Eight high active levels from the host computer that form a character byte or Control Code byte.	19	3
DATA LINE 2		20	4
DATA LINE 3		1	2
DATA LINE 4		41	18
DATA LINE 5		34	42
DATA LINE 6		43	35
DATA LINE 7		36	44
DATA LINE 8	DATA LINE 8 may be configured to select either the main or alternate character PROM.	28	44
PARITY		29	13

6.0 PRINTER INTERFACE

6.4 DATAPRODUCTS COMPATIBLE INTERFACE (Continued)

TABLE 6-4. (Continued)
DATAPRODUCTS INTERFACE SIGNALS AND PIN ASSIGNMENTS

OUTPUT SIGNALS

OUTPUT SIGNALS	DESCRIPTION	AMPHENOL CONNECTOR PINS	
		SIGNAL	RETURN
READY	A high active level from the printer to indicate: 1. AC power and DC voltages present. 2. Printer paper loaded properly. 3. Printer is not in a CHK condition.	22	6
ONLINE	High active level from the printer to indicate: 1. READY line is true, 2. Printer is ONLINE.	21	5
DATA REQUEST	High active level from the printer to synchronize host computer data transmission with printer timing. High level indicates printer data request. The signal remains high for as much as 250 nS after DATA STROBE signal is received; then the DATA REQUEST drops to low (false) and remains low until the data is stored in the printer's buffer.	23	7
GROUND	Connections for cable shield.	39	
INTERFACE VERIFY	Jumper between two pins on the interface connector that verifies that the interface connector is seated correctly.	46 45	
+5V	Supplies +5V (at one Ampere) output for the Printronix Test Exerciser.	12	

INSTALLATION

CONTENTS

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7.0 INSTALLATION

The Installation Section includes information and specifications for P-Series installation procedures. It is recommended that this sequence of procedures be followed in order to expedite installation and avoid start-up difficulties.

- ◊ Site Preparation
- ◊ Unpacking and Inspection
- ◊ Pedestal Assembly
- ◊ Pedestal Mounting
- ◊ Table Mounting
- ◊ Removing Shipping Restraints
- ◊ Installing Ribbon and Paper
- ◊ Cable Connections
- ◊ Preliminary Test

A few simple tools are required to assemble the Printronics pedestal option and remove the shipping restraints:

TOOLS REQUIRED:

- 3/32 inch Allen wrench
- 5/32 inch Allen wrench
- 5/16 inch nut driver or wrench
- 5/8 inch nut driver or wrench

7.0 INSTALLATION**7.1 SITE PREPARATION**

The printer is designed to be operated in a relatively dust-free environment, such as a computer room or normal business office. An ambient temperature of 50°F to 100°F (10°C to 38°C) and a relative humidity of 10% to 90% must be maintained to assure reliable printer operation. The site should also allow air to circulate freely around the printer. At least three feet of clear space should be provided behind the printer for access to paper.

● CAUTION ●

DO NOT BLOCK THE AIR VENTS AT THE SIDES AND BOTTOM OF THE PRINTER AS OVERHEATING AND SERIOUS DAMAGE TO THE PRINT MECHANISM AND ELECTRONICS MAY RESULT. WARRANTY MAY BE VOID IF ADEQUATE VENTILATION IS NOT PROVIDED.

7.0 INSTALLATION

7.1 SITE PREPARATION (Continued)

- **AC LINE POWER REQUIREMENTS** - A label on the back of the printer, located next to the power cord, indicates the printer's voltage and frequency requirements. Line voltage may vary $\pm 10\%$. If line voltage deviates more than $\pm 10\%$ during shuttle motor start or operation, the printer power supply should be reconfigured.

The printer employs a single phase, capacitive start, shuttle motor which requires 25.4 amperes (P600 only) for a duration of 0.5 sec upon motor start-up. It is recommended that power be supplied by a separate AC circuit of 20 amperes at 50 or 60 Hz. The printer contains primary circuit protection to accommodate the start-up current. Consult an electrician if local loads indicate sensitivity to printer operation.

A Printronix field kit for reconfiguring printer voltage and/or frequency requirements is available. Call your Printronix Service Representative for further details.

7.2 UNPACKING AND INSPECTION

1. P-Series shipping cartons are secured to a wooden pallet. Examine the shipping carton for evidence of superficial damage. If damage is apparent or suspected, do not attempt to install the printer. Make note of any damage to support claims against the carrier. Request an authorized Printronix Service Representative to inspect the printer before proceeding further.
2. If no damage is apparent, transport the printer to the installation site.
3. Cut the two nylon bands that secure the packing carton. Lift the carton cover. Remove the two styrofoam end caps on the left and right sides of the printer. The brown paper package on top of the printer cover is the shipping kit. It contains the ink ribbon, character PROMs, jumper platforms, and written documentation. The inspection envelope inside the printer (labeled CAUTION) contains restraint removal procedures and a final inspection print sample.

● WARNING ●

THE PRINTER WEIGHT IS IN EXCESS OF
185 POUNDS. USE PROPER LIFTING DEVICES
TO REMOVE THE PRINTER FROM THE BASE.

4. The printer can be mounted on the Printronix pedestal option or a sturdy table that has been prepared as specified in section 7.4.

7.0 INSTALLATION

7.3 PEDESTAL ASSEMBLY

The Printronix pedestal and paper stacker must be assembled before installing the printer.

TOOLS REQUIRED: 5/16 inch nut driver

To assemble the pedestal:

1. Verify that the pedestal shipping kit contains the following:

- ◊ 2 Pedestal Legs
- ◊ 1 Modesty Panel
- ◊ 1 Paper Guide Panel
- ◊ 16 (10-34 x 5/8) Machine Screws
- ◊ 4 Lock Washers

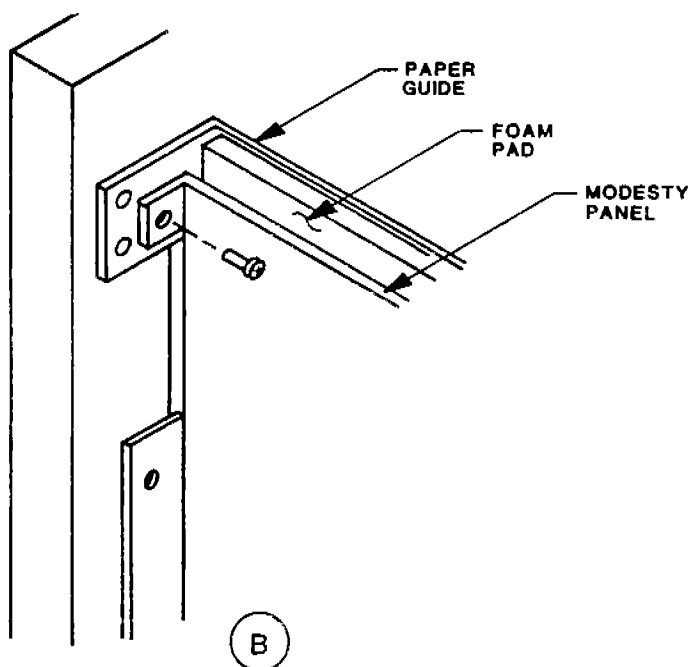
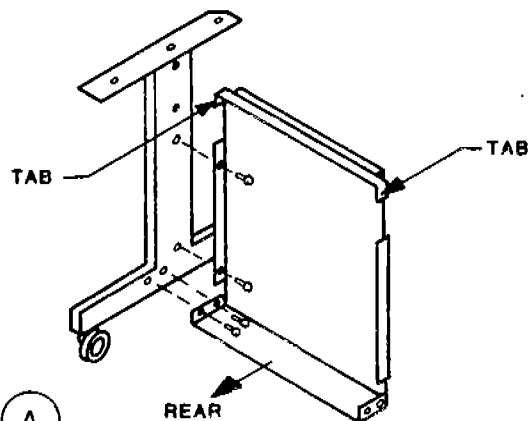
The paper stacker shipping kit contains the paper stacker and ground wire connector.

2. Position the modesty panel against the pedestal legs and loosely install four (4) screws on each side of the panel. Do not install screws through the top tabs of the panel at this time. (Figure 7-1).

3. Slide the arms of the paper guide between the modesty panel tabs and the pedestal legs. Align the mounting holes of the guide, panel, and legs; then secure with 2 screws.

4. Install screws through the remaining paper guide holes.

5. Tighten all screws.
The pedestal is now assembled.



ASSEMBLED PEDESTAL



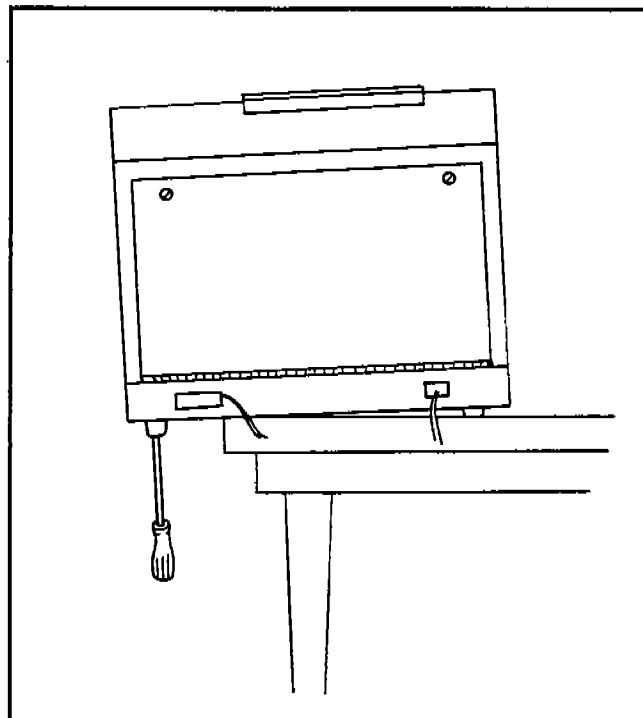
FIGURE 7-1.
ASSEMBLING THE PEDESTAL

7.0 INSTALLATION

7.4 PEDESTAL MOUNTING

TOOLS REQUIRED: 5/32 inch Allen wrench

1. Position the printer on a table so that two feet hang over the side, as in Figure 7-2. Using the 5/32 inch Allen wrench remove two feet. Turn the printer around so that the remaining two feet are accessible and remove.



**FIGURE 7-2.
REMOVING RUBBER FEET**

7.0 INSTALLATION

7.4 PEDESTAL MOUNTING

2. Face the printer and the paper guide panel in the same direction. Carefully set the printer on the pedestal. Align the rubber feet holes with the pedestal mounting holes.
3. Insert the washers on the four 10/32x5/8 inch machine screws and secure the printer to the pedestal as shown in Figure 7-3.

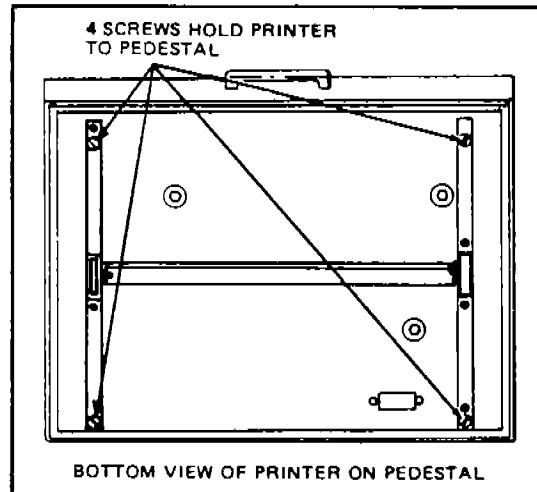
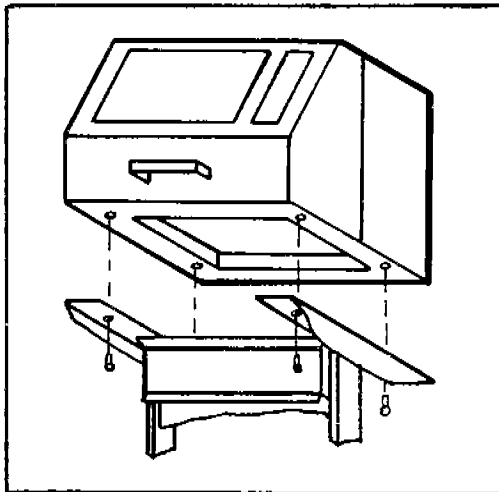


FIGURE 7-3.
PEDESTAL MOUNTING

4. Position the metal paper stacker at the rear of the printer. Be sure to attach the ground wire between the paper stacker and printer rear panel. Figure 7-4.

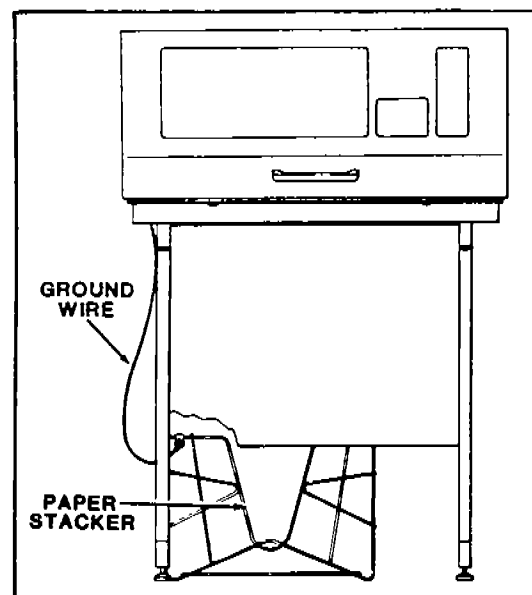
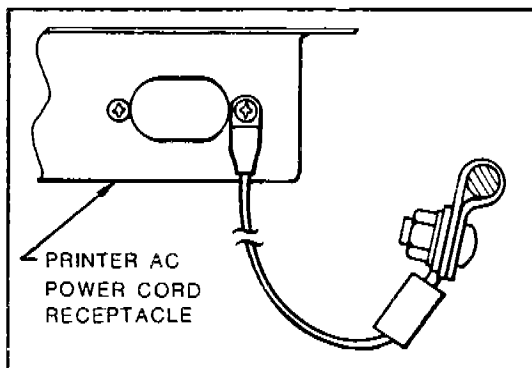


FIGURE 7-4.
GROUND CONNECTION

7.0 INSTALLATION

7.5 TABLE TOP MOUNTING

P-Series printers may be mounted on a sturdy table top instead of the optional Printronix pedestal. Table mounting requires specific modification as shown in Figure 7-5.

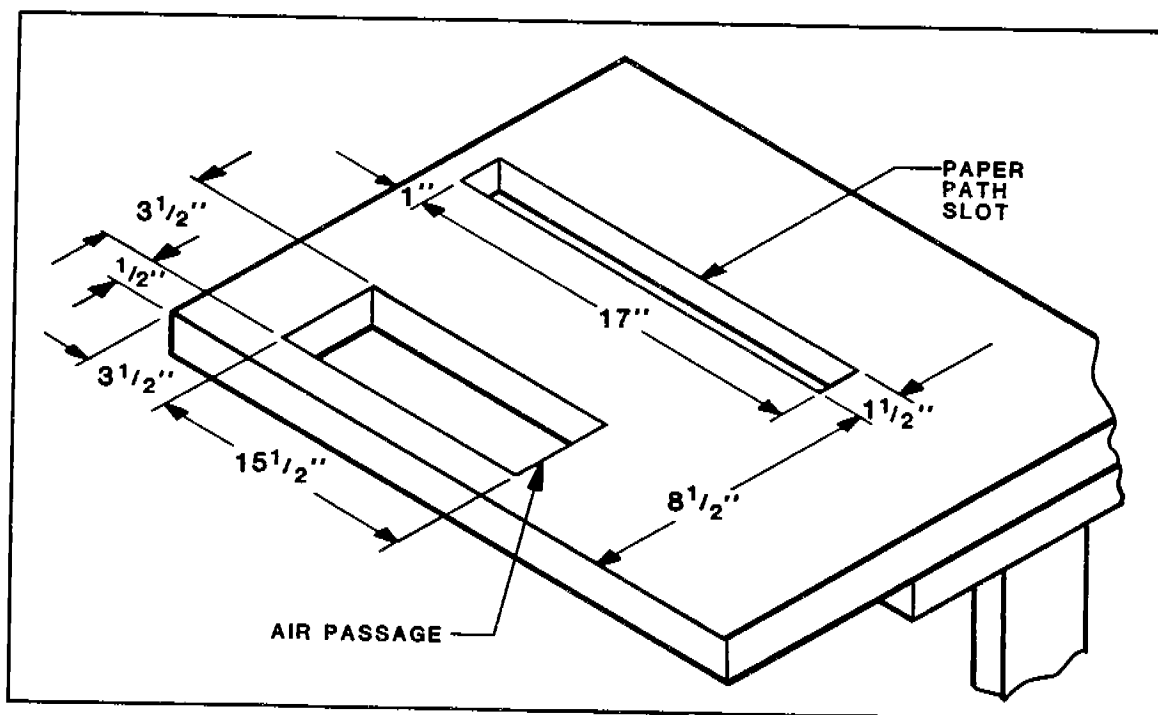


FIGURE 7-5.
TABLE PREPARATION

Once the modifications have been completed and conform to the specification, the table is ready for mounting.

Check to be sure the four rubber feet are attached at the corners of the printer base.

Position the printer on the table so that the paper will feed properly through the slot provided. After paper is loaded, the printer should be repositioned so that paper passes through the slot with $\frac{1}{4}$ inch clearance between slot ends.

If a paper stacker is used, position it behind the printer. Be sure to connect the groundwire as shown in Figure 7-4.

7.0 INSTALLATION

7.6 SHIPPING RESTRAINTS

The printer contains two restraint screws and a foam rubber pad inserted behind the tractor sprockets to prevent damage during shipping. Each screw is tagged with a red warning label. Once the printer has been properly mounted the shipping restraints may be removed. To remove the sprocket restraint pad, rotate the vertical position knob clockwise and pull the pad down and out as shown in Figure 7-5.

Remove the two screws shown in Figure 7-5 and described in the following procedure:

TOOLS REQUIRED: 3/8 inch nutdriver or wrench
3/32 inch hex wrench

1. Raise printer cover. Note the two warning labels on the shipping restraint screws.
2. Cut and remove the nylon tie wrap on Forms Thickness Adjustment lever on the left side of the printer.
3. Remove the Forms Thickness restraint screw at the left side of the printer with a 3/8 inch nut driver or wrench.
4. Remove the set screw at the right end of the platen with a 3/32 hex wrench.
5. Cut nylon string binding the power cord at the rear of the printer.

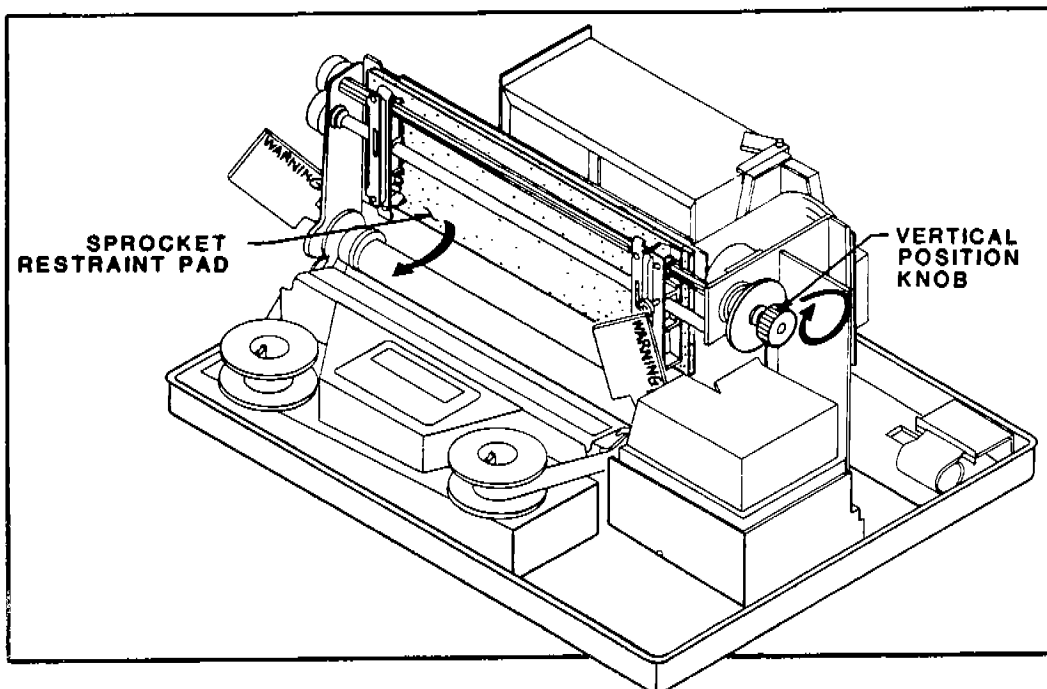


FIGURE 7-6.
REMOVING SHIPPING CONSTRAINTS

7.0 INSTALLATION

7.7 RIBBON AND PAPER

Install the ribbon (included in the shipping kit) and load paper. (For details refer to the Operator's Guide.)

7.8 CONFIGURATION

P-Series printers are custom configured by Printronix to meet the operating parameters and AC power requirements specified by the original order. If necessary, the printer may be reconfigured to meet new parameters by referring to Section 3.0 of this manual.

7.9 CABLE CONNECTION

1. Check to be sure the voltage shown on the printer ID label is the same as the site line voltage. (See Figure 7-7).

● WARNING ●

OPERATOR HAZARD AND PRINTER DAMAGE
MAY OCCUR IF THE PRINTER IS CONNECTED
TO A POWER SOURCE FOR WHICH IT IS NOT
CONFIGURED.

2. Make sure the printer POWER switch is set to OFF.
3. Connect the power cord (supplied with the printer) between the printer's AC input connector and the AC line receptacle.
4. Connect the interface cable (customer supplied) between the printer's interface connector and the host computer. (See Figure 7-7).

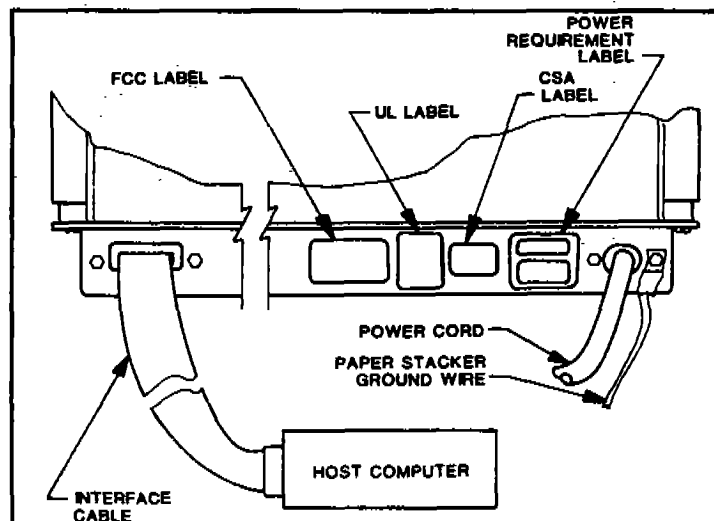


FIGURE 7-7.
PRINTER CABLES AND LABELS

7.0 INSTALLATION

7.10 PRELIMINARY TEST

After installation is complete the printer is ready for preliminary test. See Operation, Section 2.0, for location and description of operator panel controls and indicators.

1. Close front cover.
2. Set AC power switch to ON position and verify POWER indicator is illuminated.
3. Make sure the Check indicator and the Top-of-Form indicator are extinguished.

NOTE: The TOP OF FORM indicator will illuminate if the printer contains the Forms Length Selector option or the EVFU has been loaded.

If the CHECK indicator is illuminated, make sure that paper is loaded correctly and the Forms Thickness Adjustment lever is closed.

4. Make sure the printer is OFFLINE; indicator is extinguished.
5. Press the TOP OF FORM switch. The paper should advance to the next Top-of-Form.
6. Press the 8 LPI switch and make sure it illuminates.
7. Press the ON LINE pushbutton and make sure it illuminates.
8. Run the printer's test pattern by pressing both the CHECK and PAPER ADVANCE pushbuttons. Verify that several lines of the letter "E" are printed.

If problems are observed (e.g., erroneous characters and control), it may be necessary to install the alternate interface terminating resistors as described in the Interface section.

Make sure that the printer is properly configured, and the interface cables are operating correctly before installing the alternate interface terminating resistors.

SPECIFICATIONS, ACCESSORIES AND OPTIONS

CONTENTS

Specifications 8.1

Accessories 8.2

Options 8.3

TABLE

P-Series Printer Specification 8-1

8.0 SPECIFICATIONS, ACCESSORIES, AND OPTIONS

Operating parameters and physical specifications of the printer and descriptions of items, options, and supplies that apply to the P-Series printers are listed in this section.

8.1 SPECIFICATIONS

TABLE 8-1.
P-SERIES PRINTER SPECIFICATIONS

CHARACTERISTIC/FUNCTION	SPECIFICATION	
PRINTER PERFORMANCE		
PRINT SPEED (Lines per minute) Normal (Data Processing) uppercase characters Underlining or lowercase descenders Elongated (double height) characters Draft Print Option Compressed Print Option	<u>Model P300</u> 300 lpm 240 lpm 170 lpm 400 lpm 300 lpm	<u>Model P600</u> 600 lpm 465 lpm 320 lpm 800 lpm 600 lpm
LINE SPACING (lines per inch) Standard Configurable	6 and 8 lpi 6 and 9 lpi 6 and 10 lpi 8 lpi only 9 lpi only 10 lpi only	
CHARACTER MATRIX Uppercase Lowercase with Descenders Optional Full Width Sets Horizontal Line Format Normal, Elongated, and Draft characters Compressed characters P300 P600	<u>Horizontal</u> 5 dots on 9 centers 5 dots on 9 centers 6 dots on 12 centers Up to 132 characters per line (10 characters per inch). 13.3 or 16.7 characters per inch 15 characters per inch	<u>Vertical</u> 7 dots 9 dots 9 dots

8.0 SPECIFICATIONS, ACCESSORIES, AND OPTIONS

8.1 SPECIFICATIONS (Continued)

TABLE 8-1.
P-SERIES PRINTER SPECIFICATIONS (Continued)

CHARACTERISTIC/FUNCTION	SPECIFICATION
PRINTER PERFORMANCE (Continued)	
CHARACTER SET Standard Character Registration Standard Features	192 characters maximum 0.005 inch horizontal and vertical. Double-height characters Plot mode Character underline Electronic Vertical Format Unit
PLOT RESOLUTION (dots per inch) Normal Resolution High Resolution	60 horizontal, 72 vertical 120 horizontal, 72 vertical
NORMAL PLOT RATE (inches per minute) P300 P600	16.6 ipm (20 dot rows per second) 33.3 ipm (40 dot rows per second)

8.0 SPECIFICATIONS, ACCESSORIES, AND OPTIONS

8.1 SPECIFICATIONS

TABLE 8-1.
P-SERIES PRINTER SPECIFICATIONS (Continued)

CHARACTERISTIC/FUNCTION	SPECIFICATION																
ENVIRONMENT																	
TEMPERATURE Operating Storage	10° to 38°C (50° to 100° -40° to 65°C (-40° to 150°F))																
RELATIVE HUMIDITY Operating Storage	10% to 90% (non-condensing) 5% to 95% (non-condensing)																
ACOUSTIC NOISE	Generated noise is less than 65 dbA.																
PHYSICAL																	
DIMENSIONS Height Width Depth Weight	16.5 inches (41.9 cm) 30.0 inches (76.2 cm) 24.25 inches (61.6 cm) 185 pounds, (83.9 kg)																
INTERFACE																	
Type Logic Levels Data Format Compatibility Buffer Size	8-bit parallel TTL ASCII Centronics or Dataproducts 1 line (up to 132 characters)																
MAXIMUM DATA INPUT RATE (characters per second) Dataproducts Centronics	500,000 cps 200,000 cps																
ELECTRICAL																	
INPUT POWER Voltage Phase Frequency Power Consumption (at 60 Hz) Nominal Standby Nominal Operating Motor Start-up current	<table> <tr> <td>P300</td><td>P600</td></tr> <tr> <td>100/110/120</td><td>200/220/240</td></tr> <tr> <td>Single</td><td></td></tr> <tr> <td>50 or 60 Hz</td><td></td></tr> <tr> <td>P300</td><td>P600</td></tr> <tr> <td>370 VA</td><td>250 VA</td></tr> <tr> <td>480 VA</td><td>720 VA</td></tr> <tr> <td>14.2 A</td><td>25.4 A</td></tr> </table>	P300	P600	100/110/120	200/220/240	Single		50 or 60 Hz		P300	P600	370 VA	250 VA	480 VA	720 VA	14.2 A	25.4 A
P300	P600																
100/110/120	200/220/240																
Single																	
50 or 60 Hz																	
P300	P600																
370 VA	250 VA																
480 VA	720 VA																
14.2 A	25.4 A																

B.0 SPECIFICATIONS, ACCESSORIES, AND OPTIONS

B.1 SPECIFICATIONS

TABLE B-1.
P-SERIES PRINTER SPECIFICATIONS (Continued)

OPERATING CHARACTERISTIC	SPECIFICATION								
OPERATOR CONTROLS AND INDICATORS									
EXTERNAL CONTROLS (Operator Panel)	Power on/off Top-of-Form Online/Offline 6 lpi/8 lpi Paper advance Clear paper motion fault Self-test run								
EXTERNAL INDICATORS (Operator Panel)	Power on CHECK Top-of-Form 8 LPI Online								
INTERNAL CONTROLS	Forms thickness adjustment Horizontal vernier control Top-of-form adjustment Paper width adjustment								
FORMS CONTROL Perforation skip-over Electronic Vertical Format Unit	11 inches, electronic $\frac{1}{2}$ to 1 inch 14 channels, 132 lines Programmable by system software								
PAPER DRIVE SPEED (MILLISECONDS) 1/6 inch step 1/8 inch step Slow (inches per second)	<table> <tr> <th>P300</th><th>P600</th></tr> <tr> <td>33 msec</td><td>10 msec</td></tr> <tr> <td>25 msec</td><td>8.5 msec</td></tr> <tr> <td>8 ips</td><td>16 ips</td></tr> </table>	P300	P600	33 msec	10 msec	25 msec	8.5 msec	8 ips	16 ips
P300	P600								
33 msec	10 msec								
25 msec	8.5 msec								
8 ips	16 ips								

P-SERIES

B.0 SPECIFICATIONS, ACCESSORIES, AND OPTIONS

B.1 SPECIFICATIONS

**TABLE B-1.
P-SERIES PRINTER SPECIFICATIONS (Continued)**

OPERATING CHARACTERISTIC	SPECIFICATION
PAPER	
PAPER TYPE Paper Width PAPER THICKNESS Single-part Multi-part Sheet Thickness Paper Drive	Edge-punched, fanfolded 3 to 16 inches 15 to 100 pound stock one to 6-part forms 0.025 inches maximum Adjustable tractors (8 pin engagement)
LABELS ON BACKING	
TYPE SHEET SIZE THICKNESS	One-part continuous perforated fanfold backing form. Labels must be placed at least 1/16 inch from the fanfold perforation. Backing adhesive must not be squeezed out during printing. 3 to 16 inches wide including the two standard perforated tractor feed strips. 3 to 24 inches long between top and bottom perforations. Not to exceed 0.025 inch including the backing sheet.
RIBBON	
Standard and Carbon Black NOTE: Use only ribbons that meet these specifications.	Nylon fabric 1-inch by 60 yards spool to spool; metal reverses on each end. Printronix P/N - 102247 (Standard).

8.0 SPECIFICATIONS, ACCESSORIES, AND OPTIONS

8.2 ACCESSORIES

The following accessories are available to complement the printer.

- **SLOW CLOSE COVER** A restraining device cushions the printer cover closing action.
- **QUICK ACCESS COVER** A plastic window in the cover which can be pulled open for quick access to the paper tractors without lifting the cover assembly.
- **PEDESTAL AND PAPER STACKER** A pedestal designed to position the printer for easy access and loading of paper. A metal paper stacker installs on the pedestal to catch fan-fold paper. Free rolling casters provide mobility.

8.0 SPECIFICATIONS, ACCESSORIES, AND OPTIONS

8.3 OPTIONS

Options available to extend the versatility of the printer are:

● INTELLIGENT GRAPHICS PROCESSOR (IGP-10)

The IGP-10 provides "smart" graphics processing for the P300 and P600 printers. The IGP boards are designed to fit into the spare card slot in the P-Series card cage. The IGP makes it easy to define, store, and print forms and labels in a single print pass. Functions that can be performed with the IGP-10 are:

- ◊ **ONLINE FORMS GENERATION** - Boxes, corners, vertical and horizontal lines, logos and special form size print can be generated for a preprinted appearance.
- ◊ **VARIABLE BAR CODES** - Size, rotation and bar code data fields are easy to define and print.
- ◊ **EXPANDED CHARACTERS** - Characters can be created up to 99 times larger than normal for labels, titles, and signs. The vertical and horizontal sizes of characters are controlled independently to create different appearances.
- ◊ **LOGOS** - Expanded characters and reversed print, can combine with graphics to create customized logos. Up to 16 logos may be stored and then called from a library either alone or in combination with the forms generation mode.
- ◊ **REVERSE PRINT** - Printing is reversed to white on black, while the background shows as either grey or black.
- **MULTI-MODE PRINT** - Multi-Mode printing allows a choice of three different print styles; Draft, Compressed, or Normal (data processing). Compressed print allows printing 132 character lines on standard 8½ x 11 inch paper (P300). Compressed print can be selected by host computer or operator. Draft print allows high speed print at 400 lpi for the P300 and 800 lpi for the P600.
- **COMPRESSED PRINT** - Compressed printing allows a choice of two different print styles; Compressed, or Normal (data processing).
- **FORMS LENGTH SELECTOR** - The Forms Length Selector allows an operator to preset the length of a paper form in increments of 1/6 inch, up to 16½ inches long.

8.0 SPECIFICATIONS, ACCESSORIES, AND OPTIONS

8.3 OPTIONS (Continued)

- **RS-232 INTERFACE BOARD** - The interface board permits connection of serial asynchronous data devices to the printer. Features of the Interface Board are:

XON/XOFF - The XON/XOFF feature can regulate the amount of data in the 2-K character buffer to prevent overruns.

ACK/NAK - If the ACK/NAK is selected the interface can request retransmission of data as parity errors are detected. Both transmit and receive control characters are user programmable.

SELECTABLE BAUD RATE - User selectable baud rates range from 75 baud to 19.2k baud.

- **DATAPRODUCTS LONG LINES ADAPTER**

The Dataproducts Long Lines Adapter is designed for systems requiring extreme distances between host computer and printer. The Adapter's differential drivers and receivers allow interface cable lengths of up to 500 feet.

- **SPECIAL AND CUSTOM CHARACTER SETS**

96 character, ASCII
64 character, OCR full width
EBCDIC
Block Characters
Custom Character Sets

For further information and samples of character fonts, refer to the Printronix PROM Character Sets manual available from the Printronix Customer Service Department.

APPENDIX

CONTENTS

Configuration Checklist	9.1
Standard ASCII Character Set and Control Codes	9.2
Data Byte Dot Patterns	9.3
Plot Data Line Format	9.4
Plot Data Byte Format	9.5
Logic A & B PCBAs	9.6
EVFU Control Codes	9.7

9.0 APPENDIX

The appendix section contains the commonly referenced Tables and Figures as listed below:

- ◊ Configuration Checklist
- ◊ Standard ASCII Character Set and Control Codes
- ◊ Data Byte Dot Patterns
- ◊ Plot Data Line Format
- ◊ Plot Data Byte Format
- ◊ Logic A & B PCBAs
- ◊ EVFU Control Codes

9.0 APPENDIX

9.1 CONFIGURATION CHECKLIST

The Configuration Checklist below can be used to verify the hardware-selectable jumpers installed in your printer. Refer to section 3.0 of this manual for the PCBA removal and identification process.

TABLE 9-1.
CONFIGURATION CHECKLIST

JUMPER FUNCTION	PCBA A4, B7 A6, B9	POSITION	JUMPER	PINS	CHECK STATE	
					In	Out
10 lpi	B	9K	W9	2-13		
Automatic L. F.	A	9K	W12	5-10		
Binary Count	B	9K	W12	5-10		
CR=New Line	A	9K	W13	6-9		
Data Line 8	A	8K	W4*	4-11		
Paper Instruction (PI)	A	8K	W5**	5-10		
EVFU Disable	B	8K	W7	7-8		
Even Dot Plot	A	9K	W9	2-13		
Inverted DSTB	A	8K	W2	2-13		
Line Spacing	B	9K	W8	1-14		
Paper Motion Detector	B	8K	W6	6-9		
P600 Enable	B	8K	W5	5-10		
Plot Speed	B	8K	W4	4-11		
Polarity Select	A	8K	W7	7-8		
P300 or P600 Enable	B	9K	W11	4-11		
P300 or P600 Enable	B	9K	W13	6-9		
P300 Enable	A	9K	W11	4-11		
Skipover	B	8K	W1	1-14		
Perforation	B	8K	W2	2-13		
	B	8K	W3	3-12		
Underline	A	8K	W3	3-12		
Uppercase Enable	A	8K	W6	6-9		

* May be required for Centronics compatibility.

** Required for Centronics compatibility.

9.0 APPENDIX

9.2 STANDARD ASCII CHARACTER SET AND CONTROL CODES

ASCII	Binary	Oct	Dec	Hex
Space	0100000	040	32	20
!	0100001	041	33	21
"	0100010	042	34	22
#	0100011	043	35	23
\$	0100100	044	36	24
%	0100101	045	37	25
&	0100110	046	38	26
'	0100111	047	39	27
(	0101000	050	40	28
)	0101001	051	41	29
*	0101010	052	42	2A
+	0101011	053	43	2B
,	0101100	054	44	2C
-	0101101	055	45	2D
.	0101110	056	46	2E
/	0101111	057	47	2F
0	0110000	060	48	30
1	0110001	061	49	31
2	0110010	062	50	32
3	0110011	063	51	33
4	0110100	064	52	34
5	0110101	065	53	35
6	0110110	066	54	36
7	0110111	067	55	37
8	0111000	070	56	38
9	0111001	071	57	39
:	0111010	072	58	3A
;	0111011	073	59	3B
<	0111100	074	60	3C
=	0111101	075	61	3D
>	0111110	076	62	3E
?	0111111	077	63	3F

ASCII	Binary	Oct	Dec	Hex
@	1000000	100	64	40
A	1000001	101	65	41
B	1000010	102	66	42
C	1000011	103	67	43
D	1000100	104	68	44
E	1000101	105	69	45
F	1000110	106	70	46
G	1000111	107	71	47
H	1001000	110	72	48
I	1001001	111	73	49
J	1001010	112	74	4A
K	1001011	113	75	4B
L	1001100	114	76	4C
M	1001101	115	77	4D
N	1001110	116	78	4E
O	1001111	117	79	4F
P	1010000	120	80	50
Q	1010001	121	81	51
R	1010010	122	82	52
S	1010011	123	83	53
T	1010100	124	84	54
U	1010101	125	85	55
V	1010110	126	86	56
W	1010111	127	87	57
X	1011000	130	88	58
Y	1011001	131	89	59
Z	1011010	132	90	5A
[	1011011	133	91	5B
\	1011100	134	92	5C
]	1011101	135	93	5D
^	1011110	136	94	5E
_	1011111	137	95	5F

ASCII	Binary	Oct	Dec	Hex
	1100000	140	96	60
a	1100001	141	97	61
b	1100010	142	98	62
c	1100011	143	99	63
d	1100100	144	100	64
e	1100101	145	101	65
f	1100110	146	102	66
g	1100111	147	103	67
h	1101000	150	104	68
i	1101001	151	105	69
j	1101010	152	106	6A
k	1101011	153	107	6B
l	1101100	154	108	6C
m	1101101	155	109	6D
n	1101110	156	110	6E
o	1101111	157	111	6F
p	1110000	160	112	70
q	1110001	161	113	71
r	1110010	162	114	72
s	1110011	163	115	73
t	1110100	164	116	74
u	1110101	165	117	75
v	1110110	166	118	76
w	1110111	167	119	77
x	1111000	170	120	78
y	1111001	171	121	79
z	1111010	172	122	7A
{	1111011	173	123	7B
|	1111100	174	124	7C
}	1111101	175	125	7D
~	1111110	176	126	7E
Delete	1111111	177	127	7F

ODD DOT PLOT USES ODD-NUMBERED POSITIONS
EVEN DOT PLOT USES EVEN-NUMBERED POSITIONS

9.0 APPENDIX

9.3 DATA BYTE DOT PATTERNS

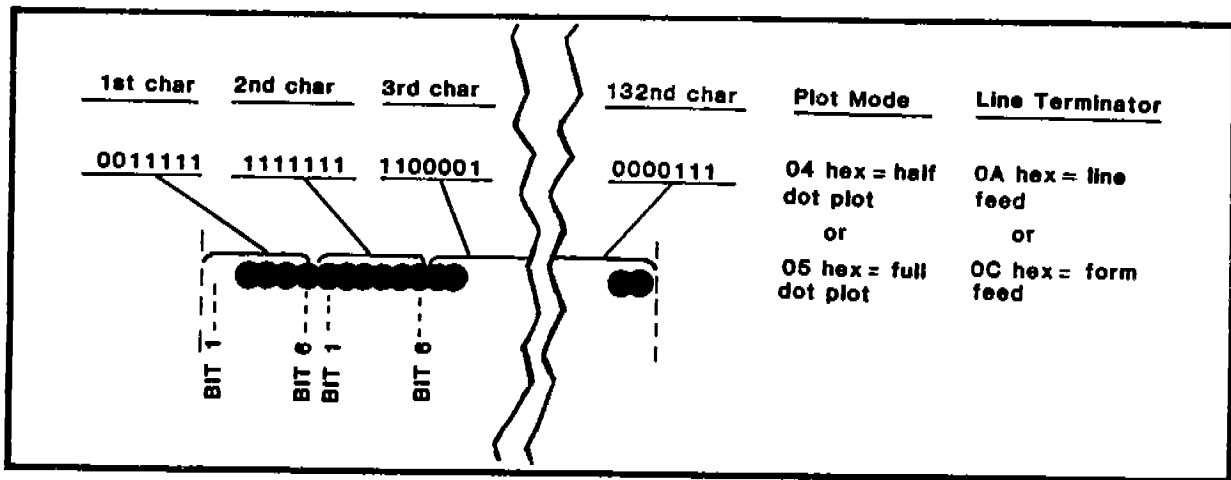
Binary	Oct	Dec	Hex	ASCII	2 4 6 8 10 12 1 3 5 7 9 11	Binary	Oct	Dec	Hex	ASCII	2 4 6 8 10 12 1 3 5 7 9 11	Binary	Oct	Dec	Hex	ASCII	2 4 6 8 10 12 1 3 5 7 9 11
01000000	040	32	20	Space	●●●●●●	10000000	100	64	40	@	●●●●●●	11000000	140	96	60		●●●●●●
01000001	041	33	21	!	●●●●●●	10000001	101	65	41	A	●●●●●●	11000001	141	97	61	a	●●●●●●
01000010	042	34	22	"	●●●●●●	10000010	102	66	42	B	●●●●●●	11000010	142	98	62	b	●●●●●●
01000011	043	35	23	#	●●●●●●	10000011	103	67	43	C	●●●●●●	11000011	143	99	63	c	●●●●●●
01000100	044	36	24	\$	●●●●●●	10000100	104	68	44	D	●●●●●●	11000100	144	100	64	d	●●●●●●
01000101	045	37	25	%	●●●●●●	10000101	105	69	45	E	●●●●●●	11000101	145	101	65	e	●●●●●●
01000110	046	38	26	&	●●●●●●	10000110	106	70	46	F	●●●●●●	11000110	146	102	66	f	●●●●●●
01000111	047	39	27	'	●●●●●●	10000111	107	71	47	G	●●●●●●	11000111	147	103	67	g	●●●●●●
01001000	050	40	28	(	●●●●●●	10001000	110	72	48	H	●●●●●●	11001000	150	104	68	h	●●●●●●
01001001	051	41	29	)	●●●●●●	10001001	111	73	49	I	●●●●●●	11001001	151	105	69	i	●●●●●●
01001010	052	42	2A	*	●●●●●●	10001010	112	74	4A	J	●●●●●●	11001010	152	106	6A	j	●●●●●●
01001011	053	43	2B	+	●●●●●●	10001011	113	75	4B	K	●●●●●●	11001011	153	107	6B	k	●●●●●●
01001100	054	44	2C	,	●●●●●●	10001100	114	76	4C	L	●●●●●●	11001100	154	108	6C	l	●●●●●●
01001101	055	45	2D	-	●●●●●●	10001101	115	77	4D	M	●●●●●●	11001101	155	109	6D	m	●●●●●●
01001110	056	46	2E	.	●●●●●●	10001110	116	78	4E	N	●●●●●●	11001110	156	110	6E	n	●●●●●●
01001111	057	47	2F	/	●●●●●●	10001111	117	79	4F	O	●●●●●●	11001111	157	111	6F	o	●●●●●●
01100000	060	48	30	0	●●●●●●	10100000	120	80	50	P	●●●●●●	11100000	160	112	70	p	●●●●●●
01100001	061	49	31	1	●●●●●●	10100001	121	81	51	Q	●●●●●●	11100001	161	113	71	q	●●●●●●
01100010	062	50	32	2	●●●●●●	10100010	122	82	52	R	●●●●●●	11100010	162	114	72	r	●●●●●●
01100011	063	51	33	3	●●●●●●	10100011	123	83	53	S	●●●●●●	11100011	163	115	73	s	●●●●●●
01100100	064	52	34	4	●●●●●●	10100100	124	84	54	T	●●●●●●	11100100	164	116	74	t	●●●●●●
01100101	065	53	35	5	●●●●●●	10100101	125	85	55	U	●●●●●●	11100101	165	117	75	u	●●●●●●
01100110	066	54	36	6	●●●●●●	10100110	126	86	56	V	●●●●●●	11100110	166	118	76	v	●●●●●●
01100111	067	55	37	7	●●●●●●	10100111	127	87	57	W	●●●●●●	11100111	167	119	77	w	●●●●●●
01101000	070	56	38	8	●●●●●●	10110000	130	88	58	X	●●●●●●	11110000	170	120	78	x	●●●●●●
01101001	071	57	39	9	●●●●●●	10110001	131	89	59	Y	●●●●●●	11110001	171	121	79	y	●●●●●●
01101010	072	58	3A	:	●●●●●●	10110010	132	90	5A	Z	●●●●●●	11110010	172	122	7A	z	●●●●●●
01101011	073	59	3B	;	●●●●●●	10110011	133	91	5B	[	●●●●●●	11110011	173	123	7B	{	●●●●●●
01101100	074	60	3C	<	●●●●●●	10110100	134	92	5C	\	●●●●●●	11110100	174	124	7C	'	●●●●●●
01101101	075	61	3D	=	●●●●●●	10110101	135	93	5D	]	●●●●●●	11110101	175	125	7D	~	●●●●●●
01101110	076	62	3E	>	●●●●●●	10110110	136	94	5E	^	●●●●●●	11110110	176	126	7E	~	●●●●●●
01101111	077	63	3F	?	●●●●●●	10110111	137	95	5F	_	●●●●●●	11110111	177	127	7F	Delete	●●●●●●

ODD DOT PLOT USES ODD-NUMBERED POSITIONS

EVEN DOT PLOT USES EVEN-NUMBERED POSITIONS

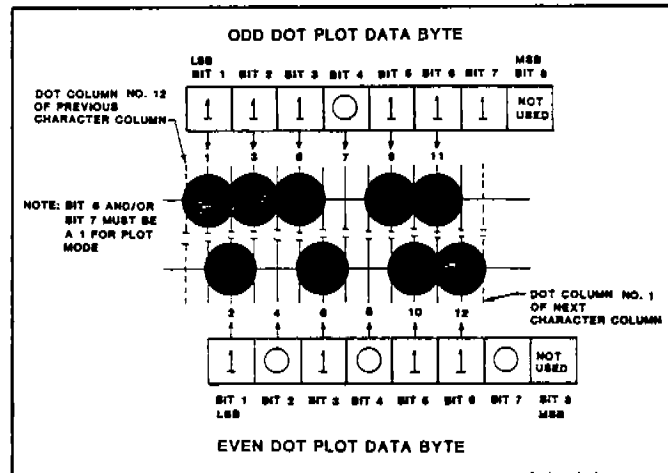
9.0 APPENDIX

9.4 PLOT DATA LINE FORMAT



9.0 APPENDIX

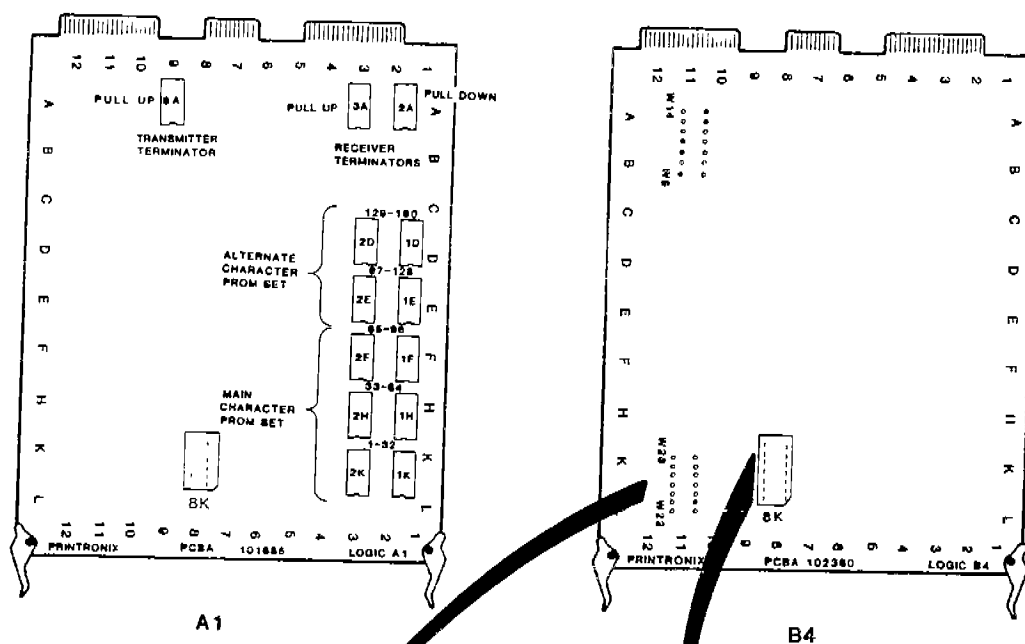
9.5 PLOT DATA BYTE FORMAT



9.0 APPENDIX

9.6 LOGIC A & B PCBA's

LOGIC PCBA A1,B4



TYPICAL JUMPER IN ETCH

- W28-○
- W27-○
- W26-○
- W25-○
- W24-○
- W23-○
- W22-○

11K

TYPICAL JUMPER PLATFORM

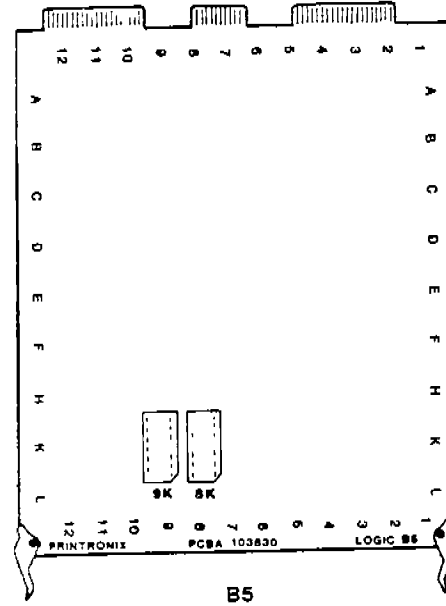
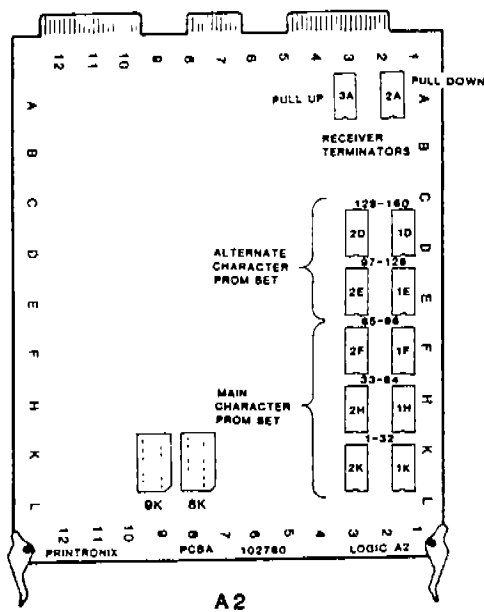
- W7-□
- W6-□
- W5-□
- W4-□
- W3-□
- W2-□
- W1-□

8K

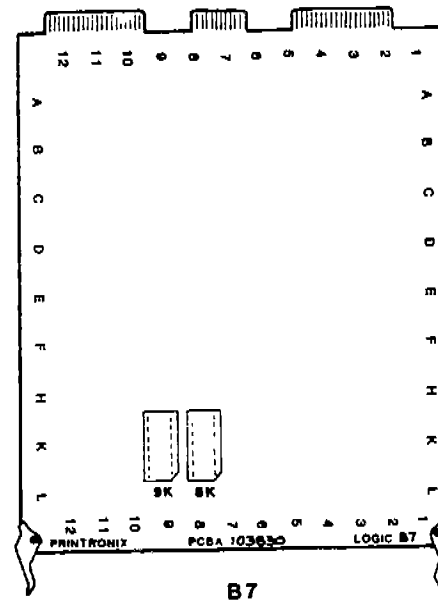
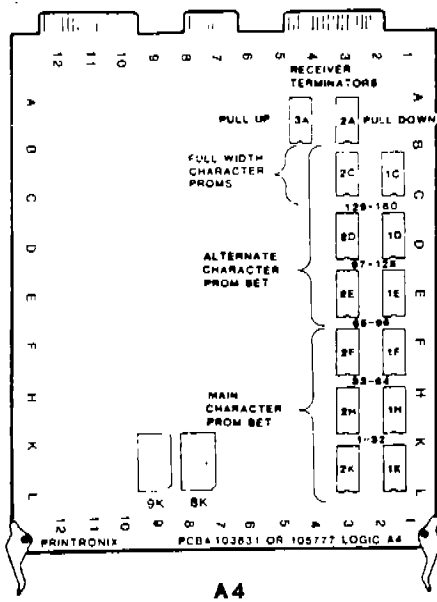
9.0 APPENDIX

9.6 LOGIC A & B PCBAs (Continued)

LOGIC PCBA A2, B5



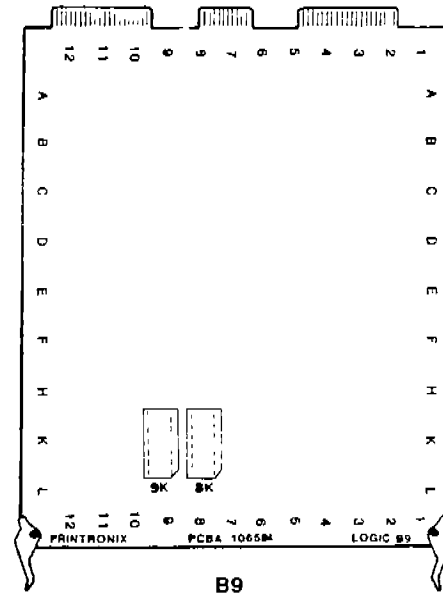
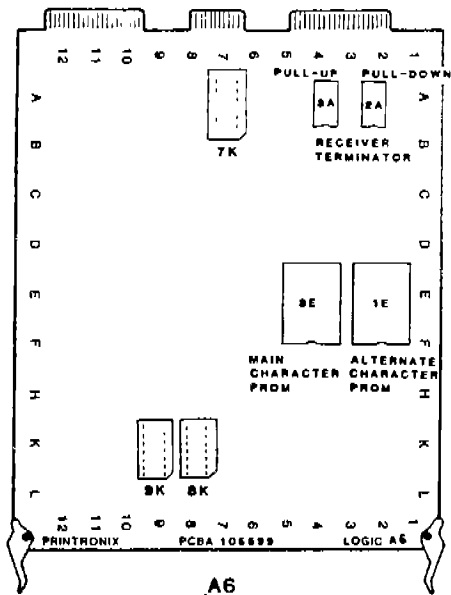
LOGIC PCBA A4, B7



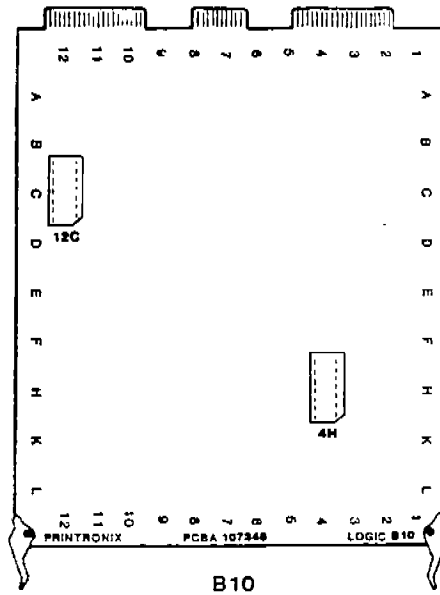
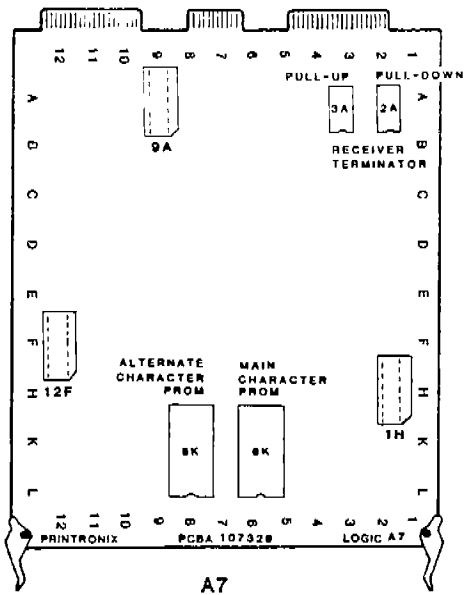
9.0 APPENDIX

9.6 LOGIC A & B PCBAs (Continued)

LOGIC PCBA A6,B9



LOGIC PCBA A7,B10



9.0 APPENDIX

9.7 EVFU CONTROL CODES

EVFU CONTROL AND LINE ID CODES
WITH PI SIGNAL
(DATAPRODUCTS, RS-232 INTERFACES)

FUNCTION	EVFU CHANNEL	HEX	DECIMAL	OCTAL	ASCII	PI SIGNAL LEVEL
Top-of-Form	1	00	0	000	^@	1
General Use	2	01	1	002	^A	1
General Use	3	02	2	002	^B	1
General Use	4	03	3	003	^C	1
General Use	5	04	4	004	^D	1
General Use	6	05	5	005	^E	1
General Use	7	06	6	006	^F	1
General Use	8	07	7	007	^G	1
General Use	9	08	8	010	^H	1
General Use	10	09	9	011	^I	1
General Use	11	0A	10	012	^J	1
Vertical Tab	12	0B	11	013	^K	1
General Use	13	0C	12	014	^L	1
General Use	14	0D	13	015	^M	1
Start Load	--	6E	110	156		1
End Load	--	6F	111	157		1

EVFU CONTROL CODES WITHOUT PI SIGNALS
(CENTRONICS INTERFACES)

FUNCTION	EVFU CHANNEL	HEX	DECIMAL	OCTAL	ASCII
Top-of-Form	1	10	16	020	^P
General Use	2	11	17	021	^Q
General Use	3	12	18	022	^R
General Use	4	13	19	023	^S
General Use	5	14	20	024	^T
General Use	6	15	21	025	^U
General Use	7	16	22	026	^V
General Use	8	17	23	027	^W
General Use	9	18	24	030	^X
General Use	10	19	25	031	^Y
General Use	11	1A	26	032	^Z
Vertical Tab	12	1B	27	033	^[
General Use	13	1C	28	034	^\ ^]
General Use	14	1D	29	035	
Start Load	--	1E	30	036	
End Load	--	1F	31	037	